FOR AGES 7 AND UP

Discovering BASIC with Wozzy

FOR THE APPLE® II PLUS, IIe, OR IIc

CECILE DIMON
AND
JOANNE CARTON

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CECILE DIMON AND JOANNE CARTON

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Equipment Needed

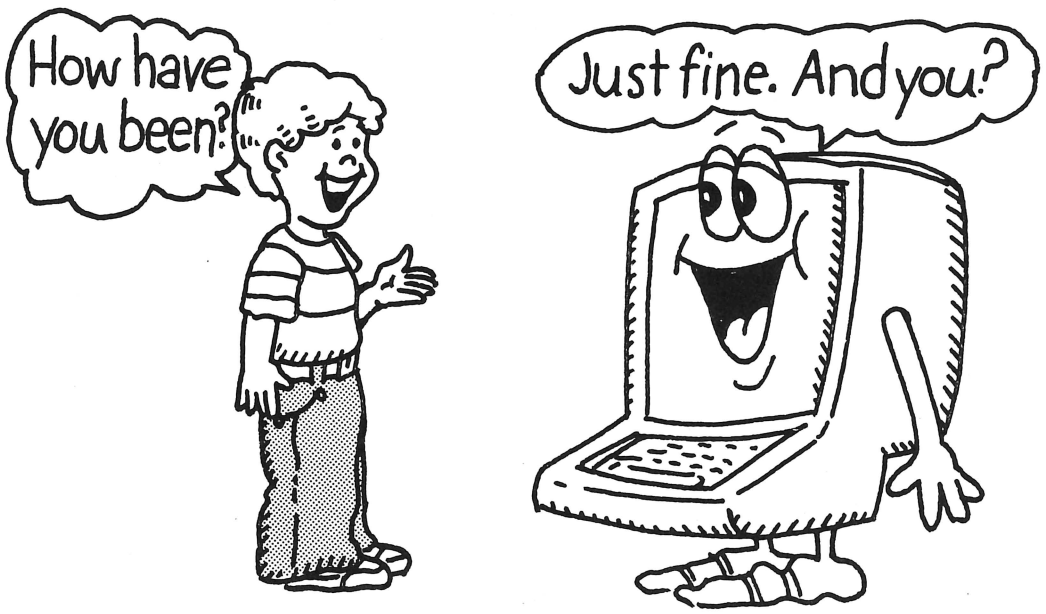
To use the programs in this book, you will need the following equipment:

- Apple II Plus, IIe, or IIc
- Disk drive
- TV or monitor (color optional)

Discovering BASIC with Wozzy

Introduction: Undercover

Welcome to a world of fun—the world of computers. *Discovering BASIC with Wozzy* is a book that will help you have fun with your computer. You will learn how to "talk" to your computer. And best of all, you will learn how to make your computer "talk" to you! This is called programming.



Helping Hands

Throughout this book, you are going to have a friend who will help you remember some of the new things you are learning about the computer.

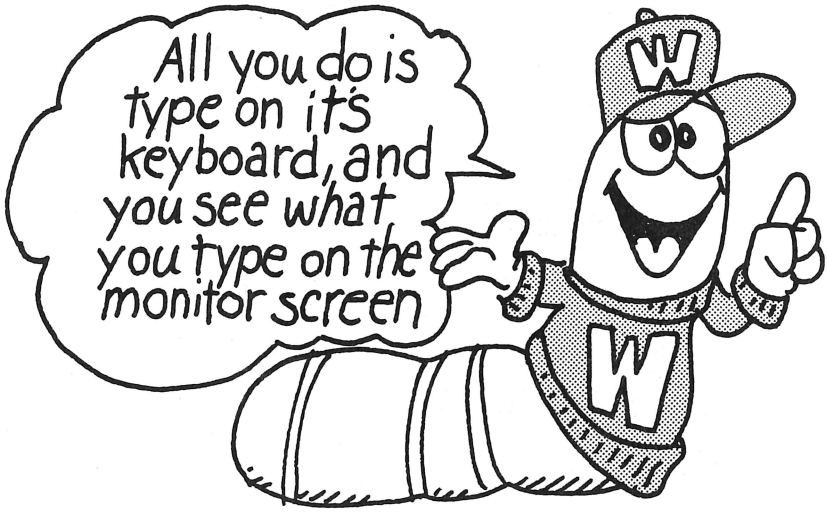
Meet Wozzy.

His favorite thing is a computer and he enjoys knowing that boys and girls are learning how to use computers. Wozzy knows that everybody is going to be using a computer in some way in the very near future.

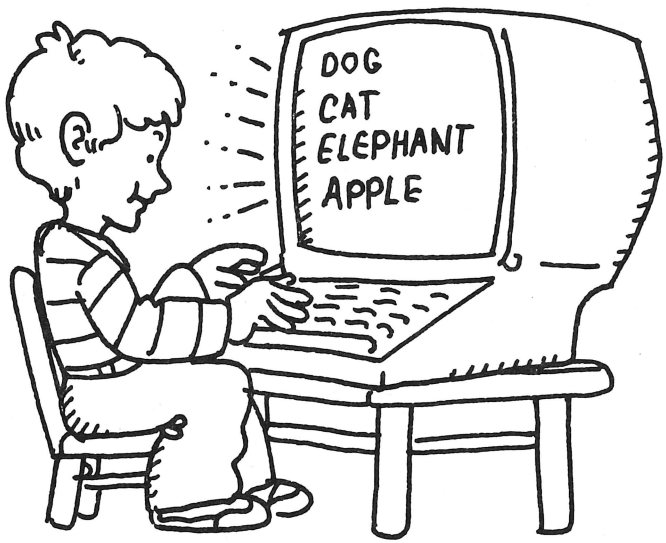
Your computer is a tool for you, just like a pencil and paper are tools. A tool is something that helps you do a job easier. A tool can also be fun. You can draw pictures and play games with a pencil and paper. Well, you can do the same things with a computer, but a computer can do even more. You can use the computer to do math; you can use programs that someone has written; or you can write your own programs.

To talk to, or program, a computer you must know special words. In this book you will learn these words. They are part of a computer language—**BASIC.** Most home computers know the BASIC language.

By now you may be asking, "How do I talk to a computer?" Well, that's easy!

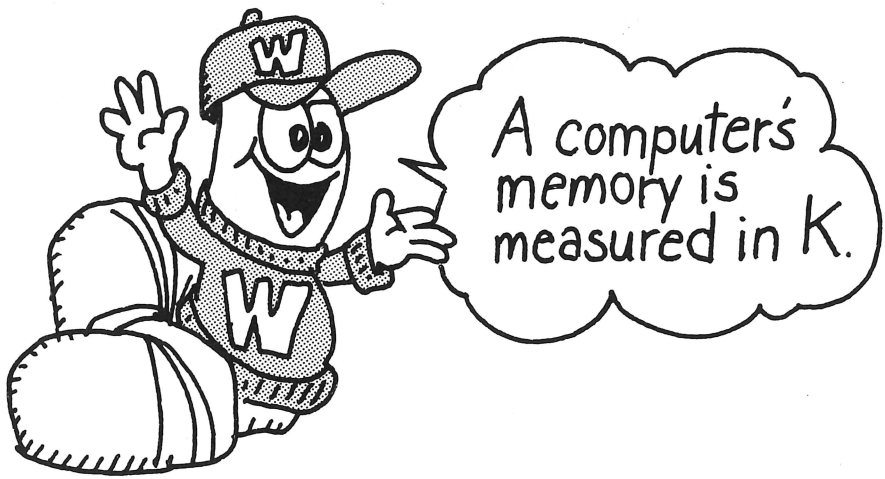


When you type a BASIC word on the keyboard, the word goes into the computer's **memory.** The computer can store, or keep, that word or many words in its memory. You can also get any information you put into the memory back out again.



Computers are not all the same. For one thing, some computers have more memory than others.

A computer's memory can be measured. It's almost like measuring people. You measure people's height in feet. However, a computer's memory is measured in **kilobytes,** or **K.**



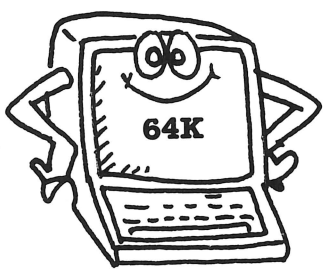
Remember talking about feet in school? You learned that 1 foot equals 12 inches. Like feet, kilobytes can be broken into smaller parts, which are called **bytes.**

1 K = 1024 bytes

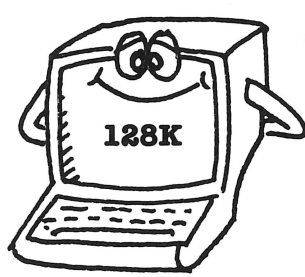
And guess what! A byte is made up of smaller units called **bits.**

1 byte = 8 bits

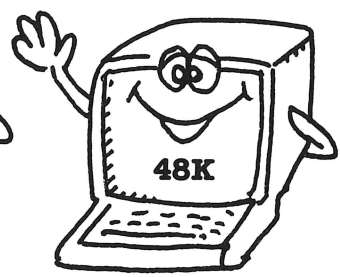
Now that you know a little about measuring memory, can you tell which computer has the most memory?



Computer A



Computer B



Computer C

If you said Computer B, then you are right!

Now you can tell the amount of memory a computer has. But did you know that computers have two different kinds of memory?

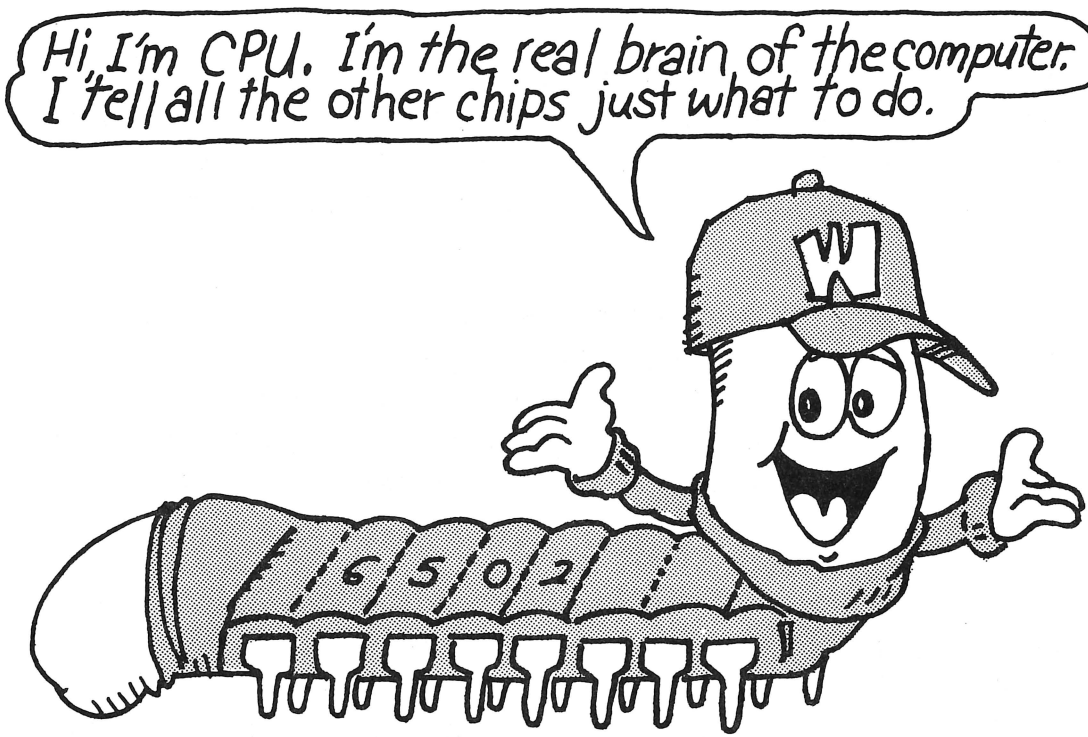
ROM stands for **read only memory.** Facts are stored in ROM. These facts always stay the same. For example, number facts are in ROM. The number facts never change. No matter how many times you ask the computer to add 2 and 2, it will always answer 4.

RAM stands for **random access memory.** Unlike ROM, the information stored in RAM can be changed. RAM is the memory you use when you type in your own programs. Each time you change your program, you change the information in RAM. Remember, when you turn off your computer, everything in RAM is erased.

Would you like to know what ROM and RAM look like? To find out, you can look inside your computer. BE SURE YOUR COMPUTER IS TURNED OFF AND SOMEONE IS HELPING YOU. If you peek under the cover of your Apple computer, you

are in for a surprise! You won't see lots of wires. Instead, you will see a large board at the bottom of the computer. This is the "motherboard." It is filled with many tiny electric pathways, called **chips.**

And the most important chip is the **central processing unit,** or **CPU** for short. The CPU is like a "boss" to all the other "worker" chips.



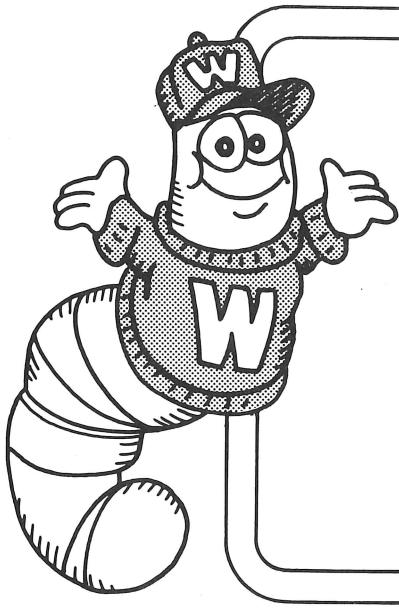
To find the CPU in your computer, just look for the biggest chip. It will probably have the number 6502 printed on the top. Now look at the other chips. You should be able to find the RAM and ROM chips.

You may also see empty slots at the back. These are for adding more memory or for hooking up disk drives or printers to your computer.

Getting to the Core

- Computer memory is measured in K.
- K means kilobytes.
- 1 K = 1024 bytes.
- 1 byte = 8 bits.
- Computers have two kinds of memory: ROM and RAM.
- ROM (read only memory) always stays the same.
- RAM (random access memory) changes as you program.
- There are memory chips inside the computer.
- The chip that controls all the others is the CPU.
- CPU stands for central processing unit.

Now you know about measuring computer memory. You also know the two kinds of memory. And you have seen the inside of your computer. In the next chapter, you will take a look at the outside of your computer and the keyboard.



CHAPTER 1

Getting Started

Turning On Your Computer

Your Apple computer has three major parts: the monitor, the keyboard, and the disk drive.

It is important that you read your manual to make sure that the parts are connected properly before turning on your computer.

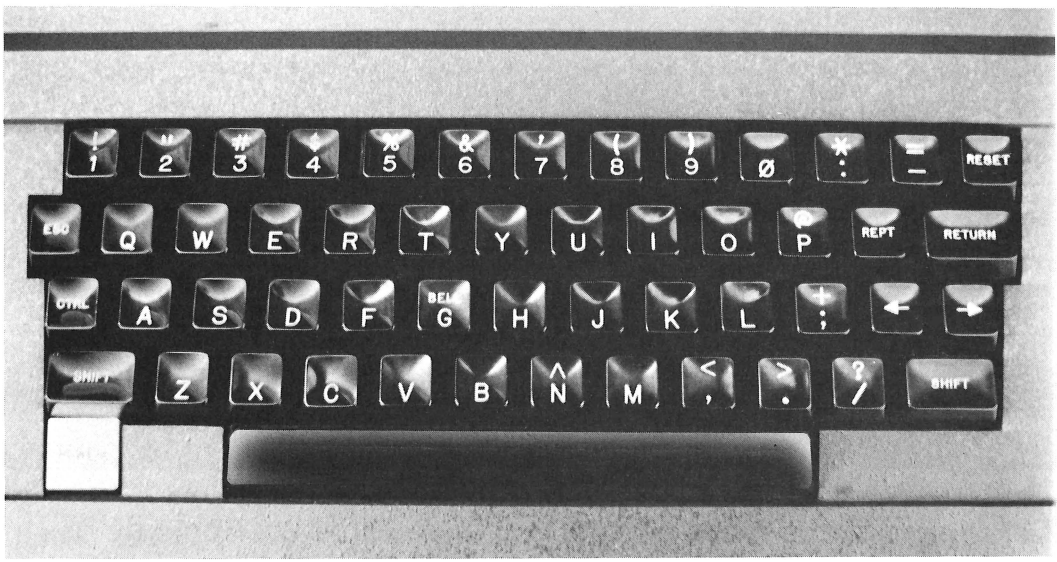
Find the ON/OFF switch on the back left-hand side of the computer. Turn this switch to the ON position. Turn the monitor switch to ON. You will notice that the red IN USE light at the front of the disk drive is on and that there is a funny whirring sound. Your computer is looking for information in the disk drive. Since you are going to write some programs of your own, you want to make the computer stop looking for information in the disk drive. To do this, look for the CONTROL (or CTRL) key on the left-hand side of the keyboard and the RESET key on the right-hand side. Press both of these keys together until the red light goes off.

You will see a] in the lower left-hand corner of your screen followed by a blinking square. You are now ready to communicate with your computer.

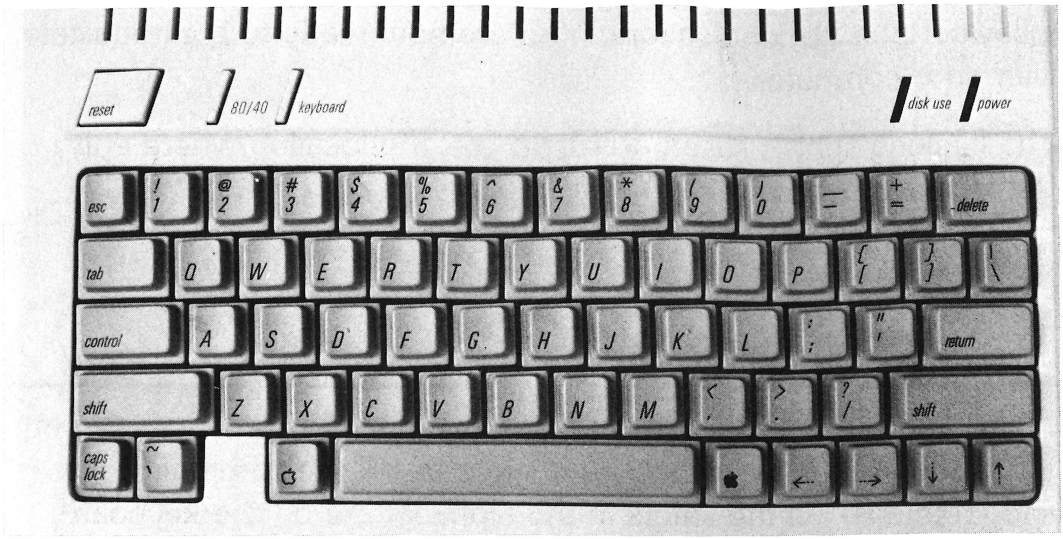
The blinking light is called a **cursor.** It is the location where entry from the keyboard will be made.

The Apple Keyboard

Let's look at the keyboard. It looks very much like a typewriter, but it has some extra keys that are needed to tell the computer to do special things. All the letters in the alphabet are on the keyboard, and all the numbers are, too. The computer is very fussy about one thing. If you type a zero, you must use the 0 and not the o. The zero is on the top row of keys under the). The letter o is located on the second row of keys between the i and the p. Don't confuse the computer. If you want to use a letter, then use o; if you want to use a number, then use 0.



Apple II Plus

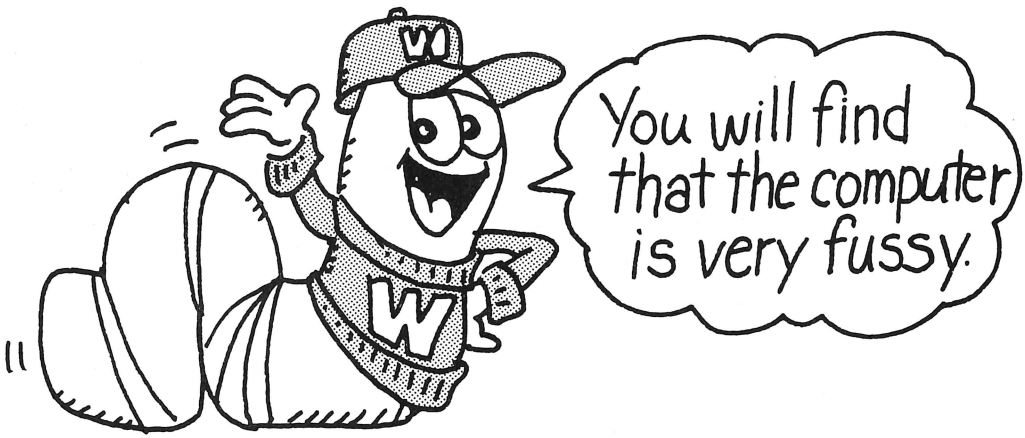


Apple IIc

Apple IIe

Let's use some of these keys. If you have either an Apple IIe or IIc, find the CAPS LOCK key on the lower left-hand side of the keyboard. Be sure it is in the DOWN position. When you are

writing your own programs, the computer wants that key down so that all the letters are capitals. The Apple II Plus will print just capital letters.



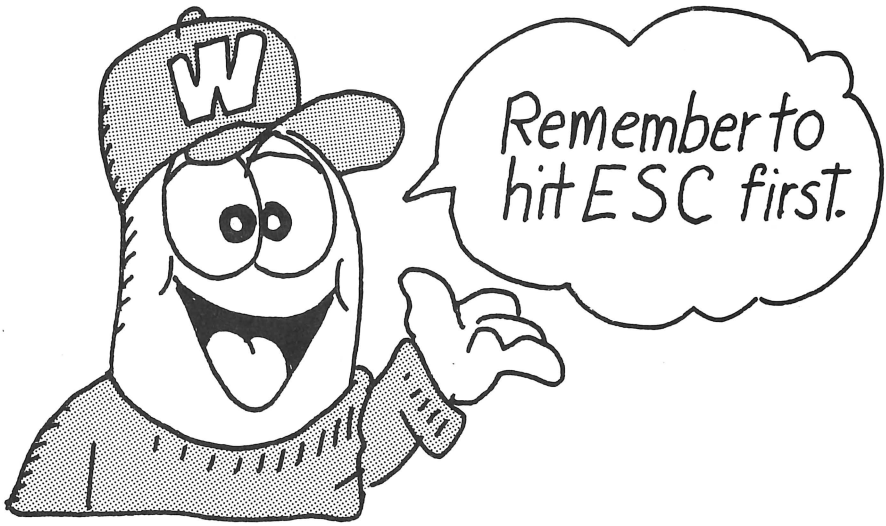
Type HOME. Find the RETURN key on the right-hand side of the keyboard and press the RETURN key.

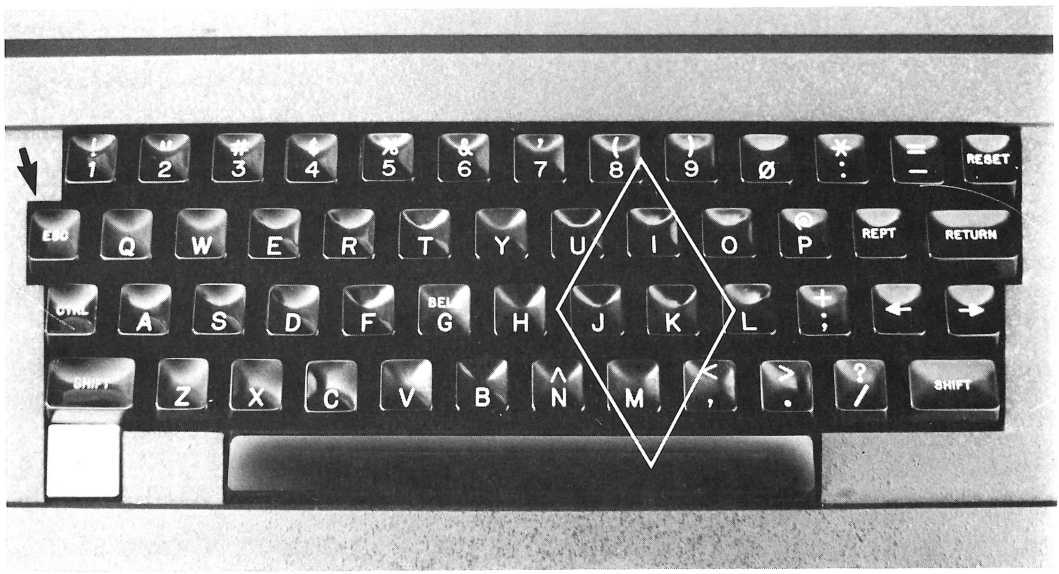
Notice that typing HOME and pressing the RETURN key moved the cursor to the top left-hand side of the screen. That's where the cursor's home is. When you HOME the cursor, you will also clear the screen of anything you have typed in.

The RETURN key is the most important key on the keyboard. It tells the computer to put into memory what you have typed on the screen. You must use the RETURN key after every instruction you give to the computer.

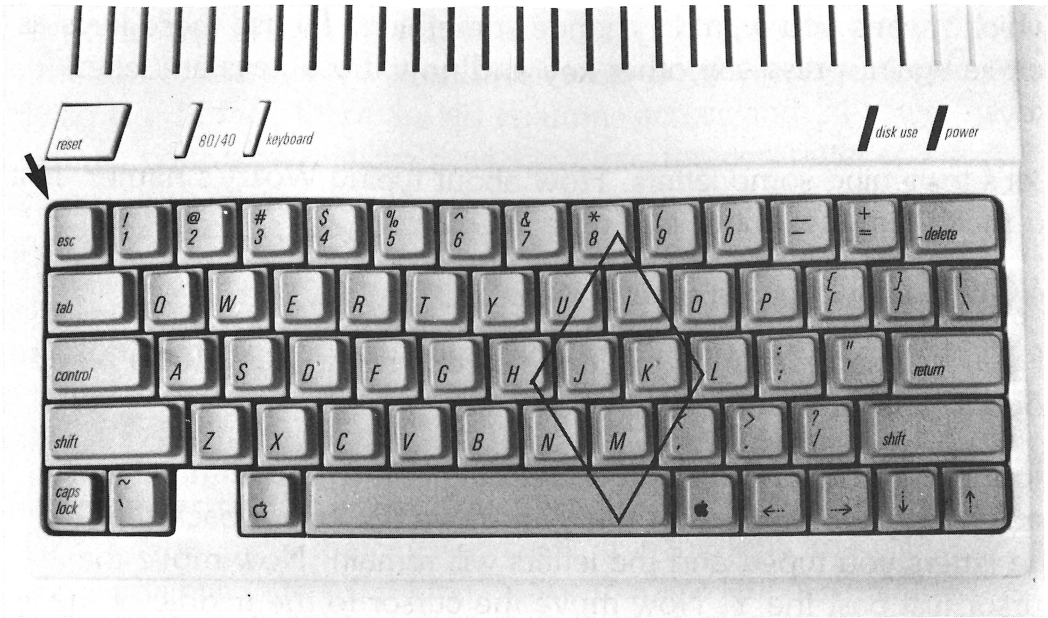
The cursor will move wherever you want it to. If you have an Apple IIe or IIc, find the four ARROW keys on the lower right-hand side of the keyboard. These are direction arrows for the cursor. Try moving the cursor left and then right. Now try to move the cursor down. Next try to move the cursor up. Hey! What's the matter here? The cursor won't move up. Remember, Wozzy said the computer is fussy. Hit the ESC (stands for escape) key and now the UP ARROW key will work.

If you have an Apple II Plus, find the LEFT ARROW and RIGHT ARROW. You can also move the cursor with the secret diamond on the keyboard. If you hit ESC first, the I, J, K, and M keys move the cursor. Try moving the cursor with the secret diamond. (These keys will also work on the Apple IIe and IIc.)

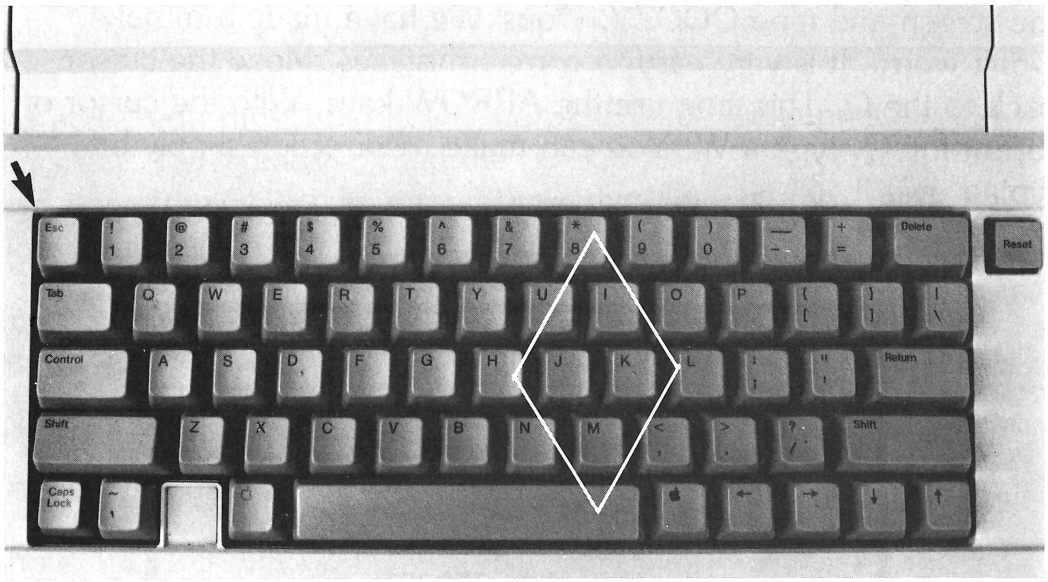




Apple II Plus



Apple IIc



Apple IIe

Notice that the I key will move the cursor up, the M key will move the cursor down, the J key will move the cursor left, and the K key will move the cursor right. When you are using these keys as the

secret diamond to move the cursor, you are in the **EDIT mode,** which means you want to change something. To use these keys as letters again, press any other key and now those keys are letter keys.

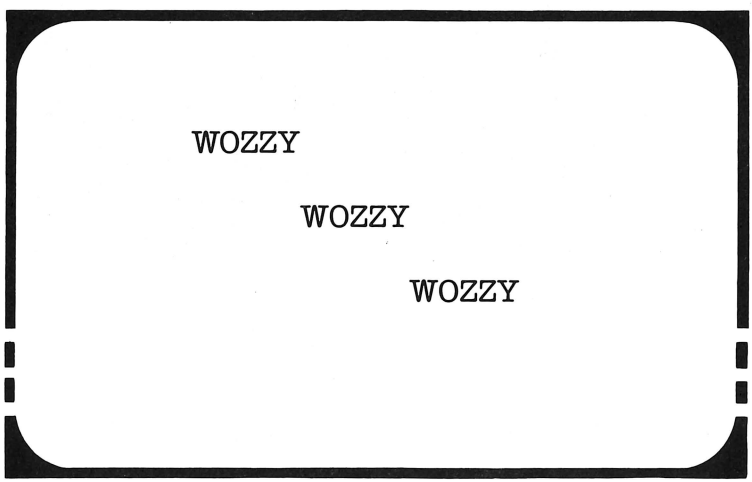
Let's try typing some letters. How about typing Wozzy's name? Just to make him feel good, let's type WOZZY.

WOZZY should be on your screen.

If you have an Apple IIe or IIc, be careful not to hold down a key too long, because the letters will repeat.

Now press ESC and use the secret diamond to move the cursor back to the W. Notice that you can move the cursor back through the letters you typed and the letters will remain. Now move the cursor just past the Y. Now move the cursor to the middle of the screen and type WOZZY again. Move the cursor to the bottom of the screen and type QOOZY. Oops! We have made a mistake. Don't worry. It is very easy to correct mistakes. Move the cursor back to the Q. This time use the ARROW keys. With the cursor on top of the Q, type a W. You can make a correction simply by typing over it.

Your screen should look something like this:



Now press the ESC key and move the cursor farther down on the screen with the M key. Notice what is happening to the WOZZY on the top of the screen. You haven't lost anything. Your screen is only so big. In fact, there are 40 columns across and 24 rows down, so your screen is like a window into the computer's memory. Sometimes there will be more in the memory than you can see on the screen.

Let's see how "repeat" works. On the Apple IIe and IIc, place your cursor on the Y in the last word. Now hold down the Y key. On the Apple II Plus, hold down the REPT key along with the Y key. Wow! We don't need that many Ys.

The computer has an eraser. Move your cursor back to the W in WOZZY. Now press the SPACE BAR. It is the long key with no name under the letters C to M. Notice that the letters disappear. The SPACE BAR erases the character to the right of the cursor.

Take another look at your keyboard. There are many keys that have two characters on them. If you want to type the top character, you must hold down the SHIFT key while pressing the other key. Let's practice. Find the + sign on your keyboard. First hold down the SHIFT key; then press the key with the + sign. Now try typing 2+2=4.

There is a special command key that is usually used with another key to tell the computer to do something. On the Apple IIe and IIc, this special command key is the CONTROL key. On the Apple II Plus, it is the CTRL key. We will use this key when we start to write a program.

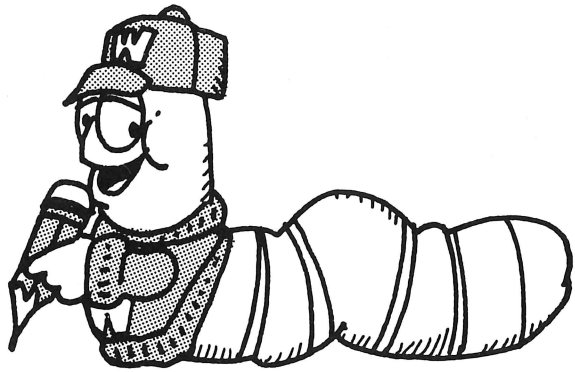
There are four keys on the Apple IIe and IIc that you will not be using at all with this book. They are keys to be used with special programs for the Apple computer. These keys are DELETE, TAB, OPEN APPLE, and CLOSED APPLE.

These keys are not on the keyboard of the Apple II Plus.

Getting to the Core

Are you having fun? Wozzy certainly hopes you are. You have learned a lot. Let's stop and go over some of those things.

- The letters and numbers on the keyboard look like those on a typewriter.
- The keyboard has special keys that you will be using:
    - SPACE BAR moves the cursor to the right and deletes the character to the right.
    - RETURN stores information on the screen in the computer's memory. RETURN also moves the cursor to the next line and waits for you to type. And it moves everything up one line. (You can move everything off the screen by hitting RETURN frequently.)
    - ESC allows the I, J, K, and M keys (the secret diamond) to move the cursor.
    - ARROW keys allow the cursor to be moved.
    - SHIFT allows you to type the top character on a key. Hold down SHIFT while pressing the key you want.
- Home is the top left side of the screen. Typing HOME and pressing RETURN will clear the screen and send the cursor home.
- The cursor marks the place where you are to type.
- EDIT mode is entered when the secret diamond is used to move the cursor around. It allows you to edit or make changes.



Paper and Pencil Exercises

Fill in the blanks.

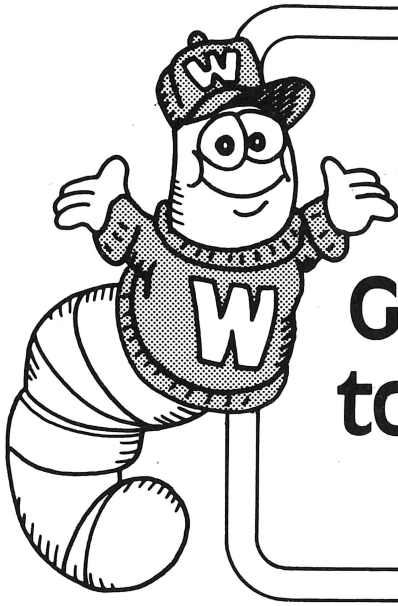
1. The _____ moves the cursor to the right and acts as an eraser.
2. To make the cursor move up, press ESC and the _____ key.
3. To type the plus sign on the screen, hold down the _____ key and the key with the equal sign.
4. The _____ key enters information into the computer's memory.

Computer Exercises

Turn on your computer. (If your computer is already on, don't turn it off. Type HOME to clear the screen.) Now do the following:

1. Type HELLO FRIEMS.
2. Use the LEFT ARROW key or ESC J to move the cursor over the M. Now type the letter N and the letter D. Notice that the cursor did not erase your mistake but allowed you to type over the letter.
3. Press RETURN. You will see ?SYNTAX ERROR.

You can move the cursor around, but you have not yet learned to talk to the computer so that it can understand you. That's coming in the next chapter.



CHAPTER 2

Giving Orders to Your Apple

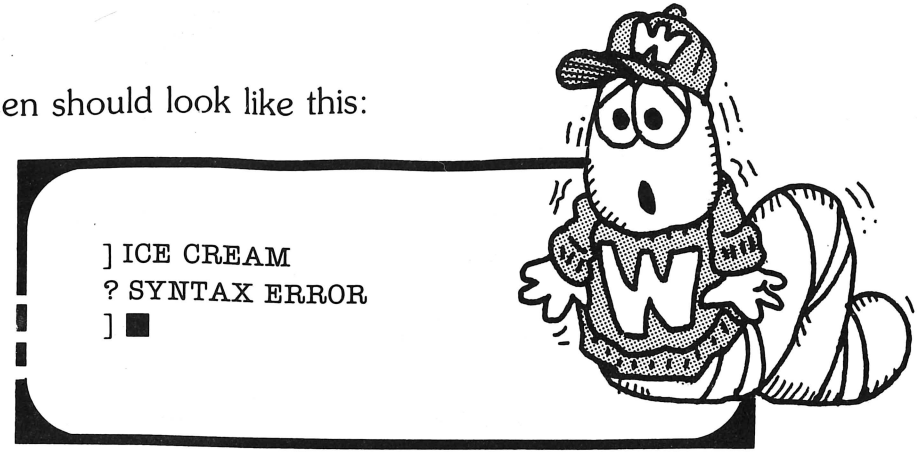
Now you will begin to learn how to talk to your computer using the BASIC language. BASIC is a language of words and signs. Just as you understand English, your Apple understands BASIC. BASIC stands for Beginners' All-purpose Symbolic Instruction Code. You can see that it is much easier to just say BASIC.

One word in BASIC that you have already learned is HOME. This word did an important job for you. It cleared your screen and took the cursor to its home position.

Wozzy and you can talk to each other by using BASIC. Your computer will understand what you are saying if you speak to it in BASIC. All the words in BASIC look like English words. Wozzy is going to show you what you can make your computer do with some BASIC words.

Type ICE CREAM on your computer's keyboard. After you have typed ICE CREAM, press the RETURN key.

Your screen should look like this:



Your computer is telling you that it does not understand you. You must use some special BASIC words before it can understand. Right now the computer is in command.

Are you ready? Good! Let's learn more about the BASIC language. Type the word PRINT and one quotation mark ("). Now type ICE CREAM followed by a quotation mark (") , and press RETURN.

When you type PRINT and use quotation marks (" "), the computer will copy whatever you type between the quotation marks.

The computer will write ICE CREAM on the screen. It now understands because you are talking to it in its language and now you can be in command. You will not get a syntax error again unless the computer doesn't understand you.

You must remember to:

1. Use the word PRINT.
2. Put your message inside quotation marks.
3. Press RETURN when you are finished.

The RETURN key puts the information into the computer's memory. If you do not press RETURN, the computer does not know what to do. Now try this:

Type: PRINT "HOORAY" (press RETURN)

Presto! Did you see HOORAY copied on the screen?

Remember, your Apple understands the BASIC language. If you do not use BASIC, you may get a message on the screen that says ?SYNTAX ERROR. This means that you made a mistake. Your Apple does not understand what to do. When you get a syntax error, check your typing and spelling. Make sure that you are using the BASIC words correctly.

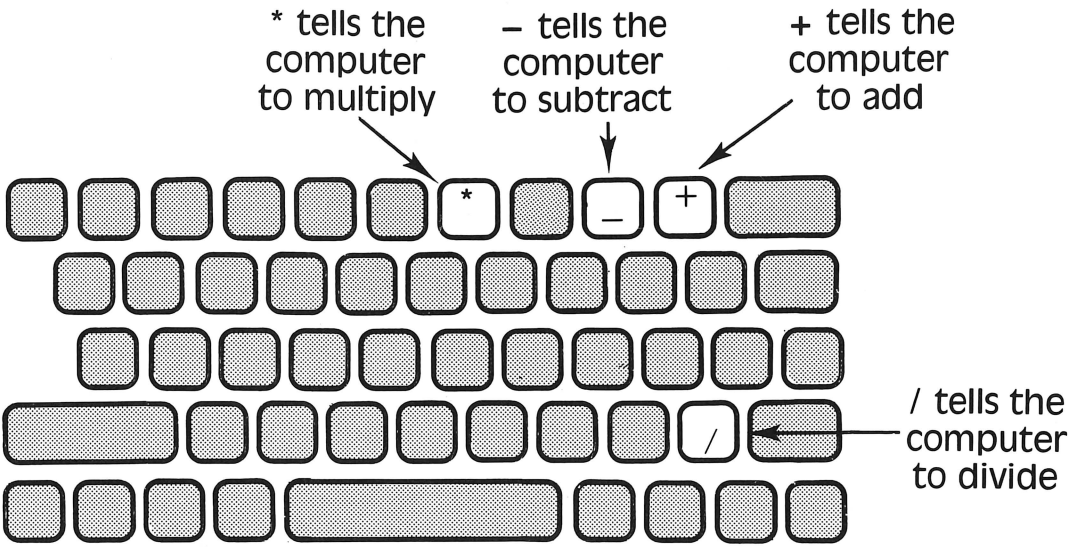
Now let's practice using the statement PRINT with " " again. Type the following words.

PRINT "COMPUTERS ARE FUN" (press RETURN)
PRINT "XYZ#!@34" (press RETURN)
PRINT "PLAY BALL" (press RETURN)

Now try printing a message of your own or have the computer copy your name. Remember, use PRINT " " and press RETURN.

The Math Wizard

Did you know that computers love to do math? They know all the number facts and will not forget them! But before you can have your Apple do your math homework, you need to know the arithmethic signs in BASIC.



To do math on your computer, use PRINT without the " ". To see how the computer will add; try this:

1. Type HOME to clear your screen (press RETURN).
2. Type PRINT 3+2 (press RETURN).

Your screen should look like this:

```
PRINT 3+2
5
]■
```

That was an easy one. Here are more, but first you might want to solve them yourself. Then check your answers with the computer.

PRINT 7−4 (press RETURN)
PRINT 2*5 (press RETURN)
PRINT 8/2 (press RETURN)

So far you have learned two BASIC statements: PRINT " " and PRINT (without the " "). By putting these statements together you can have your computer write out a math problem along with the answer.

To see this happen, type the following:

PRINT "5 + 7 = ";5+7 (press RETURN)

Can you see what happened? The PRINT " " told the computer to copy 5 + 7 = and PRINT told the computer to find the answer. The ; put the two parts of the problem together.

Try another one. Before you press RETURN see if you can guess what will appear on the screen.

PRINT "6 − 4 = ";6−4 (press RETURN)

Practice with the following problems:

1. PRINT "12 + 34 = ";12+34
2. PRINT "68 − 42 = ";68−42
3. PRINT "20 * 60 = ";20*60
4. PRINT "50 / 10 = ";50/10

Now try this big problem. Look carefully at the answer you get:

PRINT 98765*12345

Don't worry! You didn't break your computer. This is the Apple's way of writing a very large (or very small) number. It is called **scientific notation.** To read the number, move the decimal point nine spaces to the right. The number 1.21925393E+09 becomes 1219253930. When a number has a – sign next to the E, you move the decimal left. 3.778563E–05 means .00003778563.

There's one more trick to learn about doing math on a computer. Try this problem on a friend.

Use pencil and paper to find the answer:

2 + 3 * 4

You probably said 2 + 3 is 5 and 5 * 4 is 20. Now type the same problem on your computer's keyboard.

PRINT 2+3*4 (press RETURN)

Woops! What happened? Is your Apple wrong? It says the answer is 14. Your computer is not wrong. It just does math in a special way. First it multiplies and divides. Then it adds and subtracts.

Here is how the computer found the answer.

2 + 3 * 4
3 * 4 = 12 + 2 = 14

To change the order of the way the computer does math, put the numbers you first want to be added or subtracted inside parentheses ( ). To get the answer 20 on the computer, type PRINT (2+3)*4 and press RETURN.

See! The computer did the math in the ( ) first.

Getting to the Core

- PRINT " " means to copy what is inside the quotation marks " ".

  PRINT "I AM A COMPUTER NUT" (press RETURN)

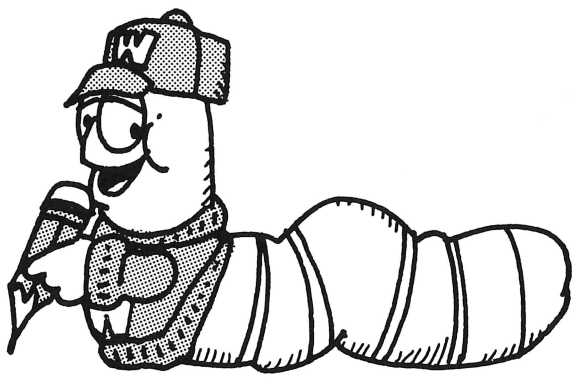
- PRINT followed by numbers means to do the math.

  PRINT 5 – 2 (press RETURN)

- Large numbers are written on the screen in scientific notation.

  Example: 1.23456789E + 09 means 1234567890
  3.6789E – 03 means .0036789

- The computer does math in a special order:
  1. First, it multiplies and divides.
  2. Second, it adds and subtracts.
  3. Parentheses ( ) change the order of the way computers do math.



Paper and Pencil Exercises

Fill in the blanks.

1. To put the information into the computer's memory always press the _____ key.

2. To clear the screen type _____ and press RETURN.

3. To make your computer do math, type _____ before the numbers.

4. If you type PRINT "HI FOLKS" and press RETURN, the computer will write _____ .

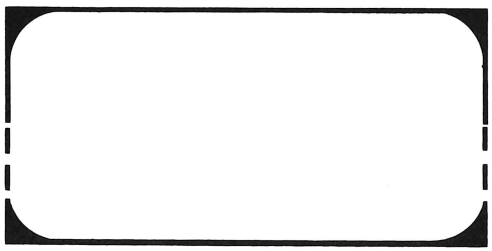
5. The number 9.87654321E+09 is in scientific notation. It means _____ .

Computer Exercises

Pretend you are the computer. Write on each screen what will appear if someone typed in what is shown. Then see if your answers are right. Type in the statements on your computer. Compare the computer's answers with yours.

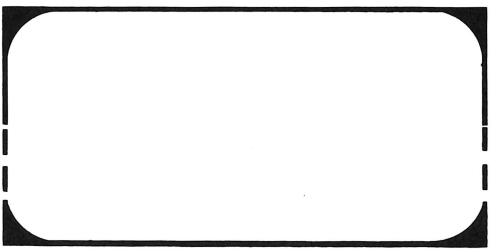
PRINT "HI PAL"

1.



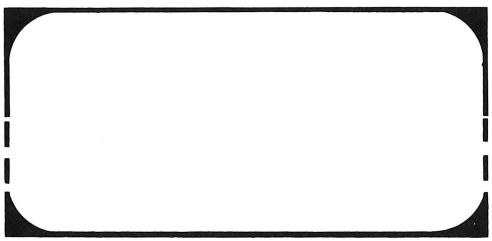
PRINT 7+2

2.



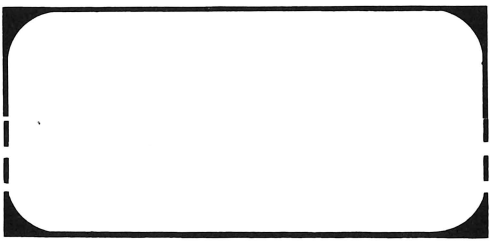
PRINT "2 * 3 = ";2*3

3.

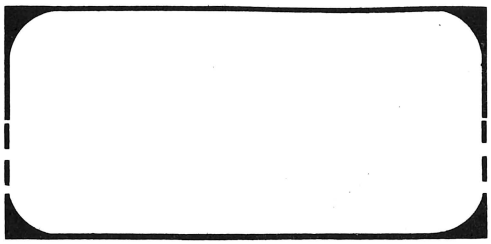


PRINT "MY NAME IS APPLE"

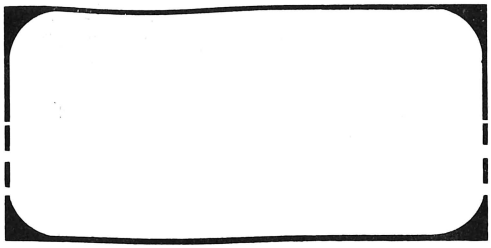
4.



5. PRINT "BASEBALL"

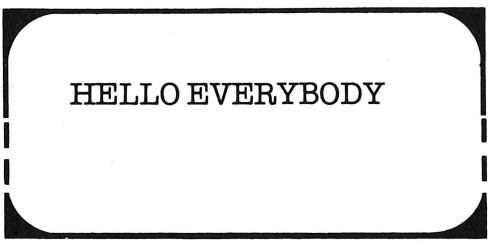


6. PRINT 8/2

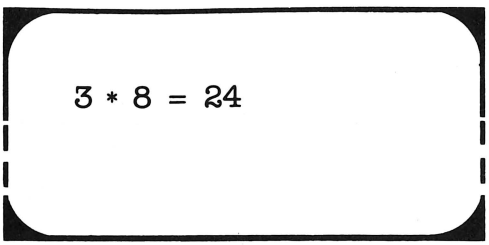


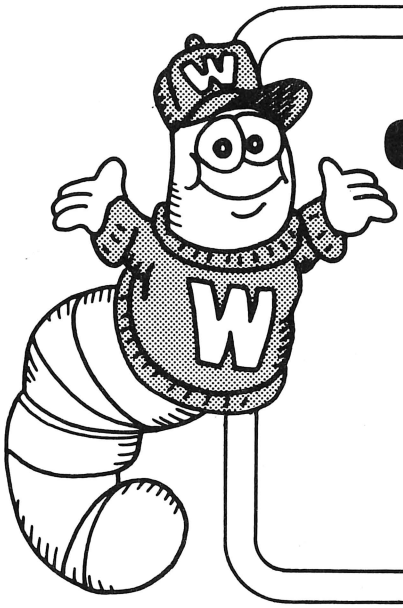
On your computer, type in the words and numbers that will make your screen look like these screens.

7.



8.

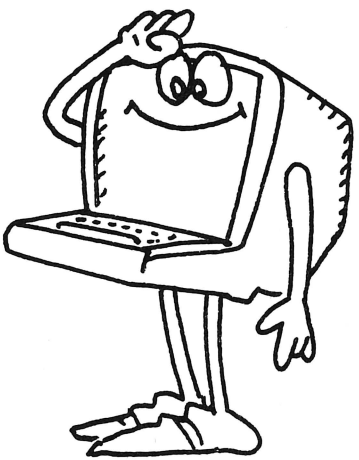




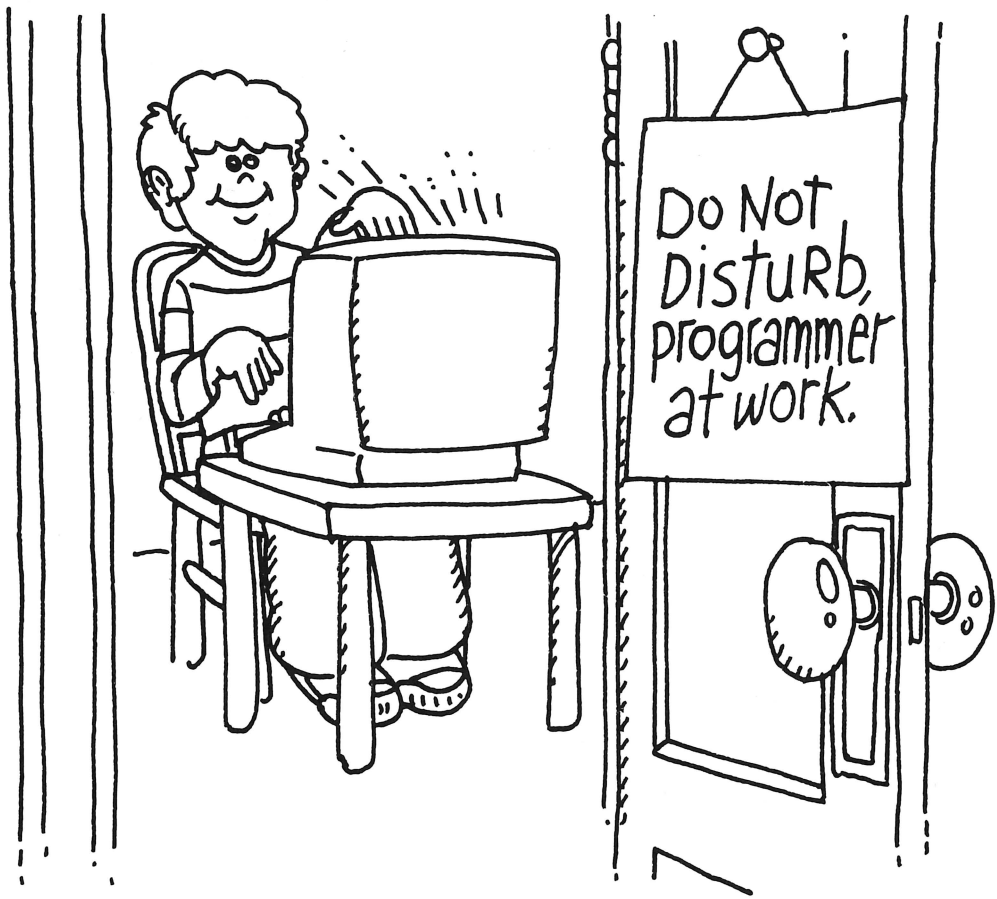
CHAPTER 3

A Flow of Ideas

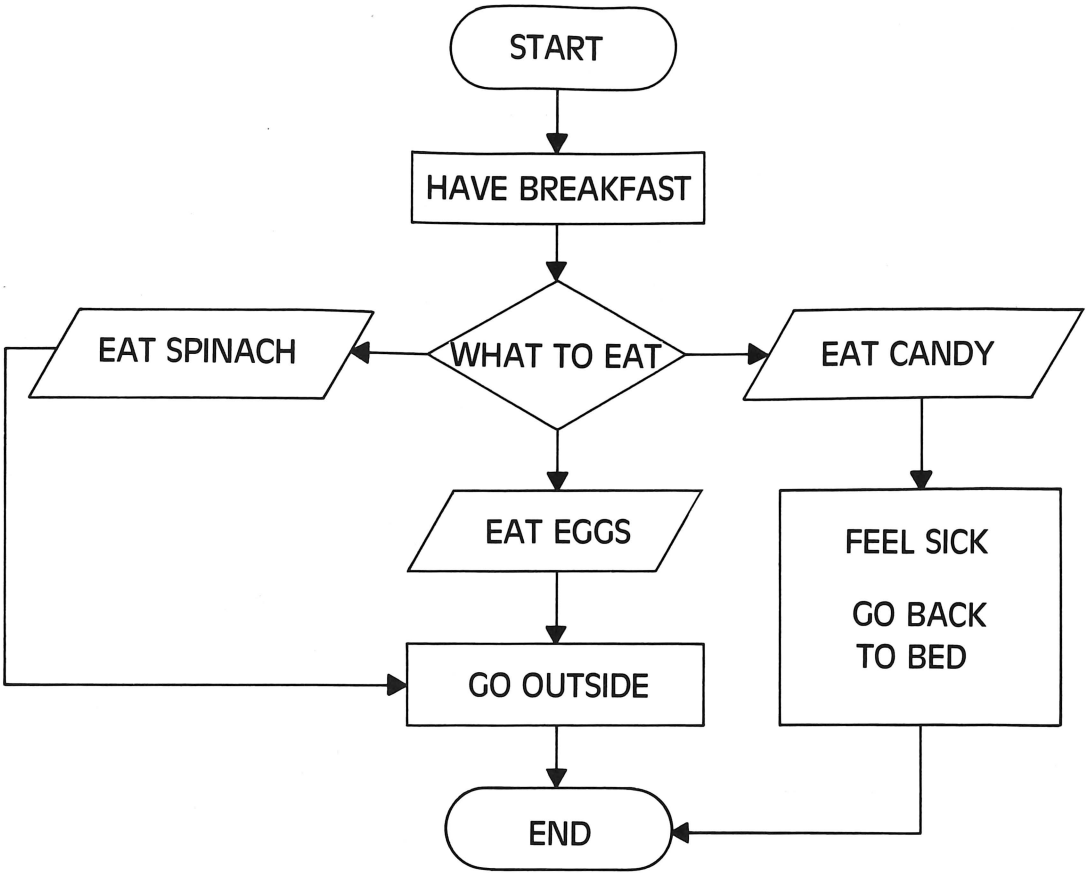
Programming: Telling Your Computer What to do

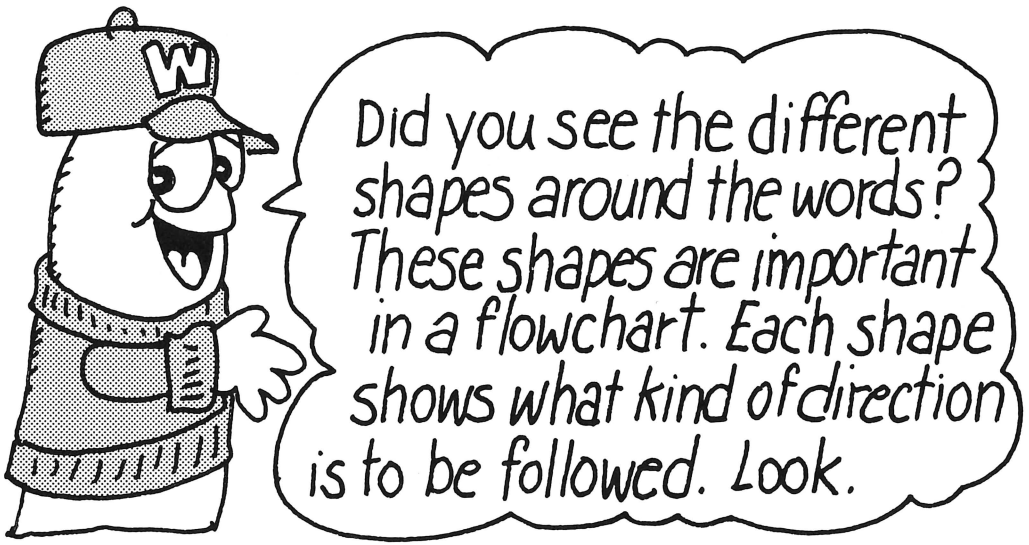


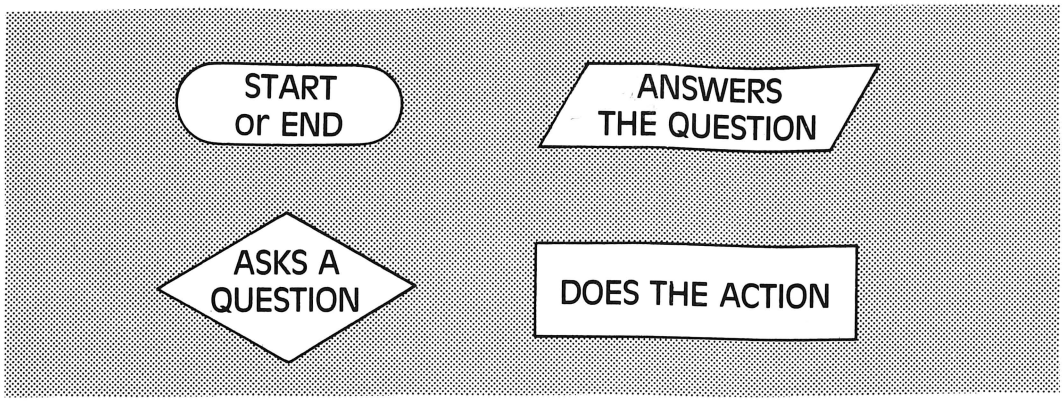
Computers can do many exciting things. But they do only what they are told to do. When people tell computers what to do it is called "programming." A **program** is a list of directions that the computer follows, step by step. Programmers are people who write programs. Reading this book will help you become a beginning programmer.



Often programmers use a chart to help them plan their program. This chart is called a **flowchart.** A flowchart is like a picture of the ideas that will be in a program. Here is a fun example of a flowchart. To read it, follow the arrows. The arrows show the ways to reach the end. Remember, this is a fun example. The directions are for people, not computers.

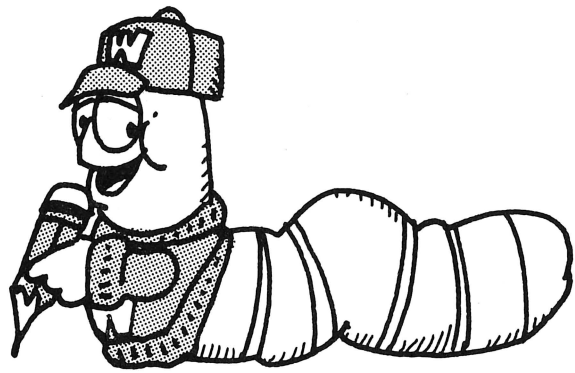

START
HAVE BREAKFAST
WHAT TO EAT
EAT SPINACH
EAT CANDY
EAT EGGS
FEEL SICK
GO BACK TO BED
GO OUTSIDE
END


Did you see the different shapes around the words? These shapes are important in a flowchart. Each shape shows what kind of direction is to be followed. Look.



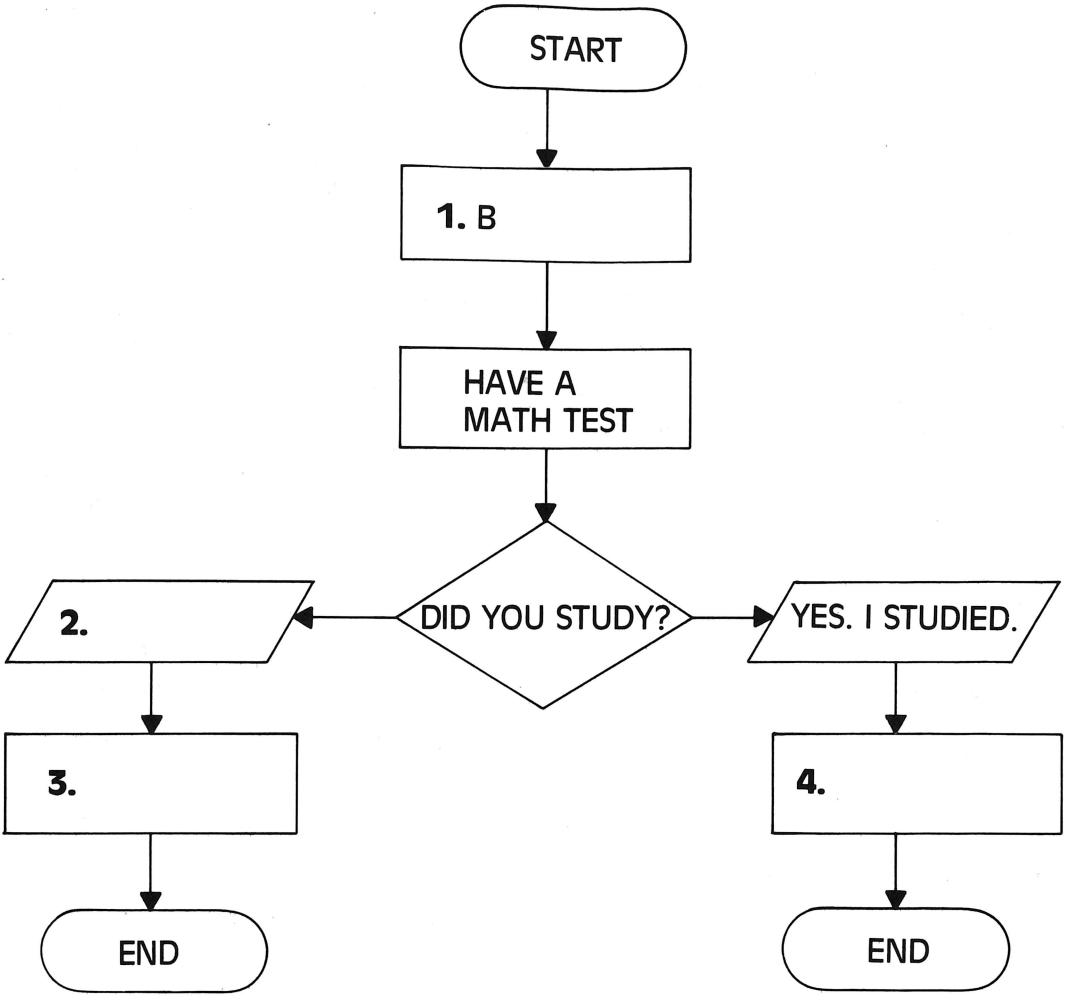
Getting to the Core

- A program is a list of directions that the computer follows.
- A flowchart shows the plan for a program in picture-shapes.



Paper and Pencil Exercises

1. Look at the flowchart on page 31. Then write the letter of each statement that goes in the numbered symbols. The first one has been done for you.

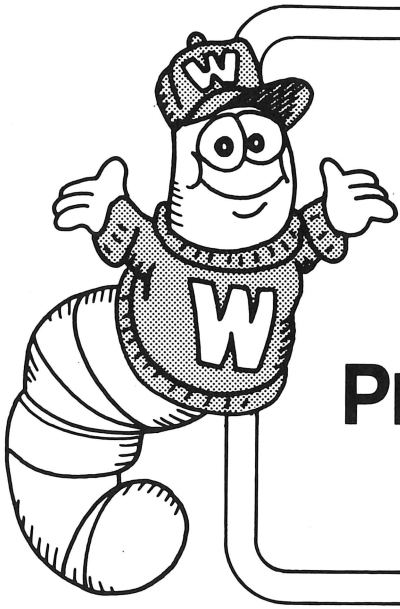


A. I PASSED.

B. GO TO SCHOOL.

C. NO.
I DID NOT STUDY.

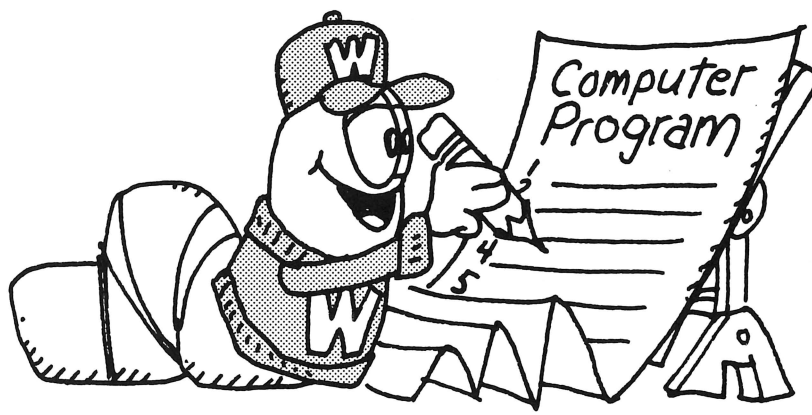
D. I FAILED.



CHAPTER 4

Beginning Programming

So far you have made your computer repeat messages and do math. To do these things, you gave the computer one direction at a time. Now you will learn to program your Apple. Remember, a program is a list of directions that the computer will follow. Each direction is written on a line. And each line in a program is numbered. These line numbers let you give the computer more than one direction at a time. Then, when you are ready, the computer will run your program in numbered order.



A program has **statements** and **commands.** A statement, such as PRINT, goes into your program. A command tells the computer what to do with your program. Two commands you will use now are NEW and RUN.

NEW erases any program that is in the computer's memory.

RUN tells the computer to begin the program that you have entered on the keyboard.

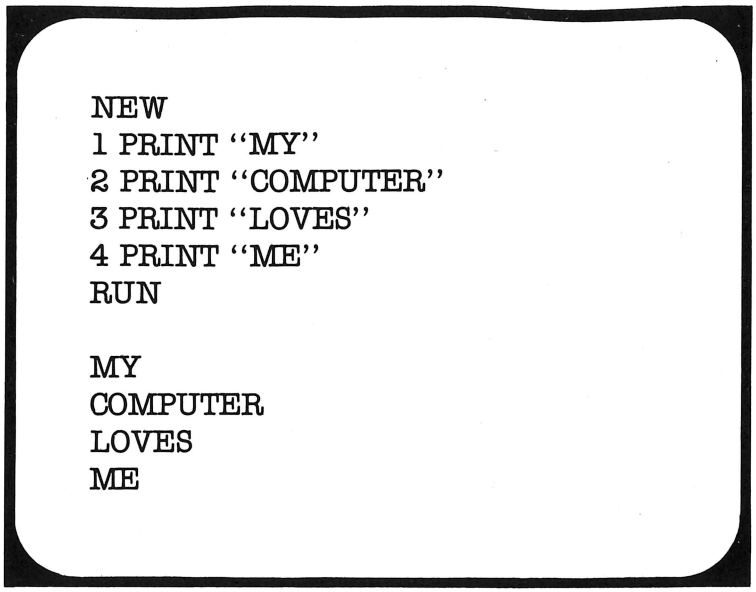
Now let's try a program:

Type: NEW (press RETURN)
1 PRINT "MY" (press RETURN)
2 PRINT "COMPUTER" (press RETURN)
3 PRINT "LOVES" (press RETURN)
4 PRINT "ME" (press RETURN)

You have just written a program. It is in the computer's memory. Are you ready to tell the computer to RUN the program? If so,

Type: RUN (press RETURN)

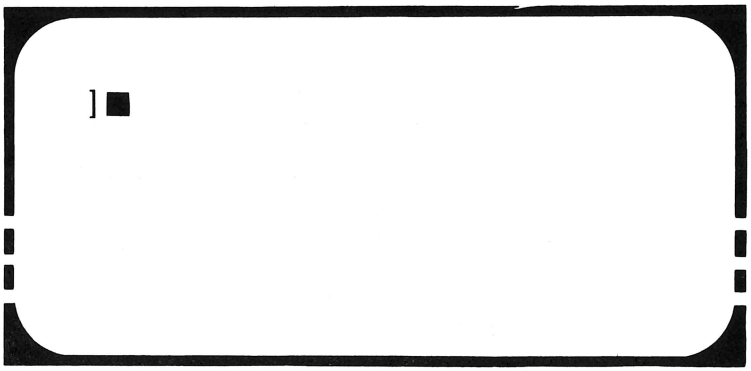
Your screen should look like this:



Do you remember the BASIC word HOME? You learned it in Chapter 2. Let's put it to work here.

Type: HOME (press RETURN)

Your screen should look like this:

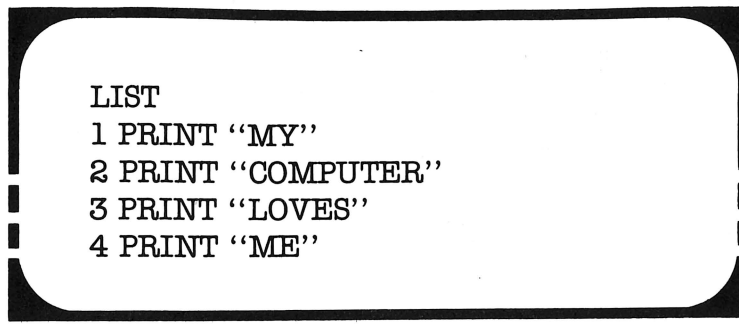


HOME erases only what is on your screen. Your program is still in the computer's memory. You can prove this by using another command: LIST.

LIST tells the computer to write out any program that is in memory.

Type: LIST (press RETURN)

Presto! There is your program again. Your screen should now look like this:

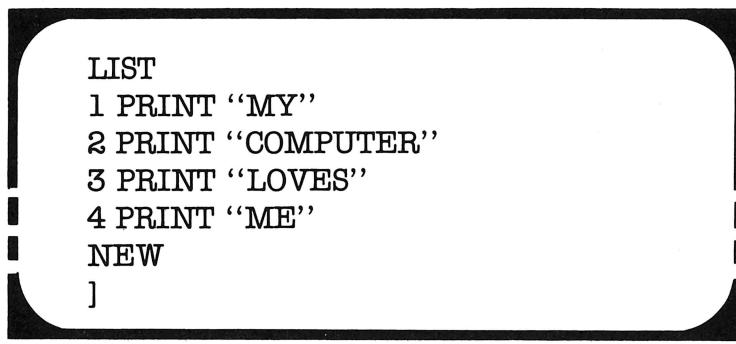


It is a good idea to LIST a program before you RUN it. When you LIST a program, you can check for mistakes. Mistakes in a program are called "bugs." You must correct the bugs (or "debug" a program) before it will RUN as you expect.

Are you ready to type in another program? If so, remember: Always type in NEW before you begin another program. NEW erases the old program from memory. Watch how it works.

Type: NEW (press RETURN)

Your screen now looks like this:



It doesn't look like anything happened. But wait.

Type: LIST (press RETURN)

See, there is no longer a program in memory. Nothing shows under the word LIST.

```
LIST
1 PRINT "MY"
2 PRINT "COMPUTER"
3 PRINT "LOVES"
4 PRINT "ME"
NEW
]
LIST
]
```

Now the memory in your Apple computer is clear. Let's clear the screen, too, and begin a new program.

Type: HOME (press RETURN)

Here's the next program. See the numbers? They are out of order. But don't worry. Your Apple will take care of that. (Remember to press RETURN after each line.)

Type: 2 PRINT "VERY"
1 PRINT "NOT"
3 PRINT "GOOD"

Now RUN the program.

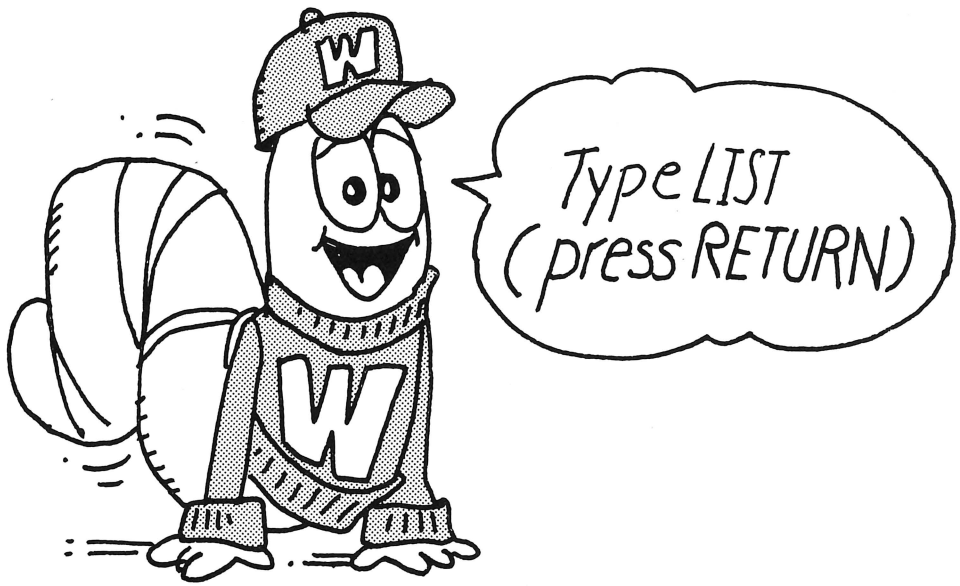
Type: RUN

Your screen looks like this:

```
2 PRINT "VERY"
1 PRINT "NOT"
3 PRINT "GOOD"
RUN

NOT
VERY
GOOD
```

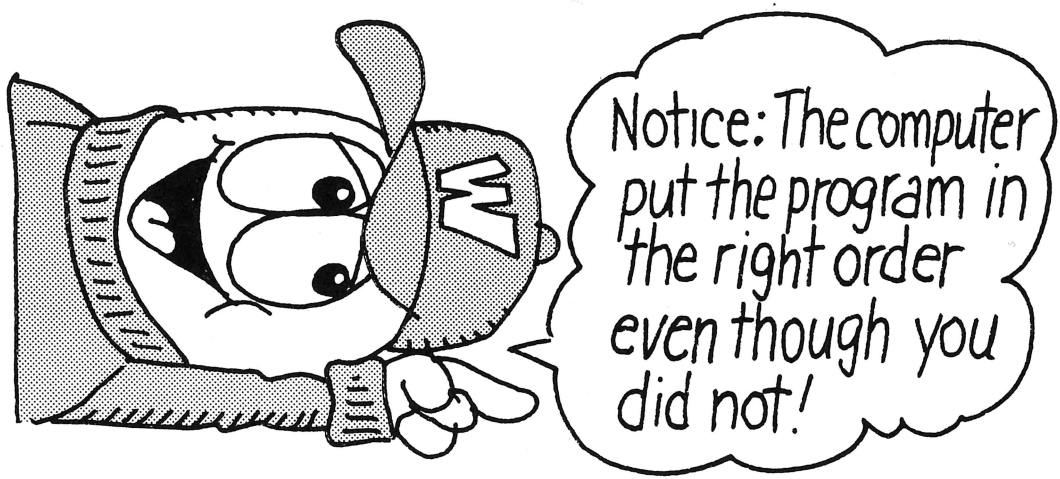
It looks like the computer changed your program. Here's what to do to see what is in the computer's memory.



```
2 PRINT "VERY"
1 PRINT "NOT"
3 PRINT "GOOD"
RUN

NOT
VERY
GOOD

LIST
1 PRINT "NOT"
2 PRINT "VERY"
3 PRINT "GOOD"
```



Now you are ready to edit, or change, your program. First you will delete, or erase, one line from your program. To delete a line, type in the line number you want to erase. Then press RETURN. Let's delete line 1 from your program. But let's clear the screen and LIST the program.

Type: HOME (press RETURN)
LIST (press RETURN)

Your screen should look like this:

```
LIST
1 PRINT "NOT"
2 PRINT "VERY"
3 PRINT "GOOD"
```

Now to delete line 1:

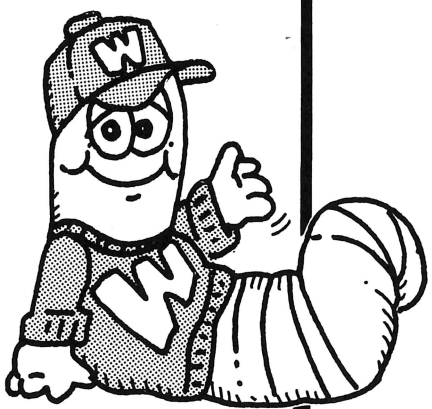
Type: 1 (press RETURN)

Now RUN your program:

Type: RUN (press RETURN)

Your screen should look like this:

```
LIST
1 PRINT "NOT"
2 PRINT "VERY"
3 PRINT "GOOD"
1
RUN
VERY
GOOD
```



The computer did not print line 1. To see that line 1 is no longer in your program, do this:

Type: LIST (press RETURN)

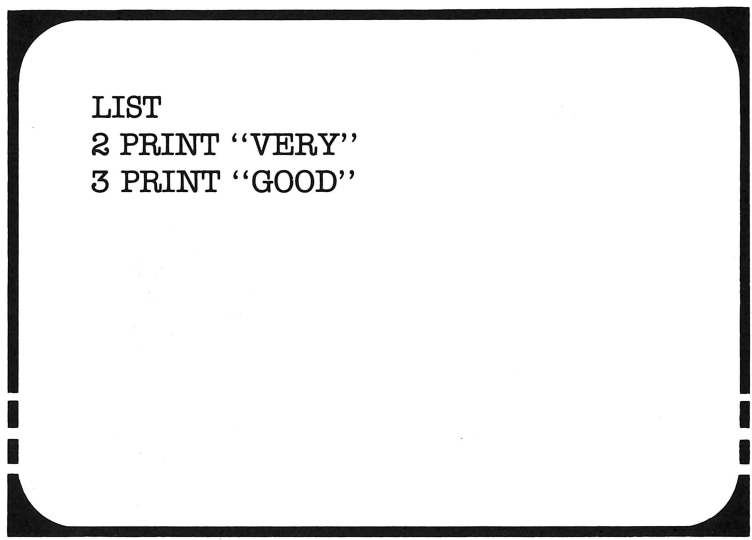
Your program now says:

```
2 PRINT "VERY"
3 PRINT "GOOD"
```

You can also put a line back into your program. First, type the line number that you want to change. Then type in the new statement that you want on that line. When you press RETURN, the new line will take the place of the old one. Let's try it with the program you have in memory. We will change line 2. First, clear the screen and LIST the program.

Type: HOME (press RETURN)
LIST (press RETURN)

Your screen now shows:



Now we will change the VERY in line 2 to SO.

Type: 2 PRINT "SO" (press RETURN)

Now RUN your program.

Type: RUN (press RETURN)

Your program should say:

SO
GOOD

Up to now you have numbered your program lines 1, 2, 3, 4, and so on. But programmers usually number their program lines by 10s (10, 20, 30, 40, and so on). This makes it easy to add lines to a program after it is written. Let's see how this works.

Type: NEW
HOME

Now the memory and screen are clear. Here's a new program. You fill in the blanks about yourself. Remember to press RETURN after each line.

```
10 PRINT "MY NAME IS _____ "
20 PRINT "MY FAVORITE COLOR IS _____ "
30 PRINT "MY FAVORITE FOOD IS _____ "
RUN
```

```
10 PRINT "MY NAME IS WOZZY"
20 PRINT "MY FAVORITE COLOR IS RED"
30 PRINT "MY FAVORITE FOOD IS CHIPS"
RUN

MY NAME IS WOZZY
MY FAVORITE COLOR IS RED
MY FAVORITE FOOD IS CHIPS
```

Now suppose you want to add a line that tells your age. You want your age printed right below your name. To do this, you must add a line numbered between 10 and 20. Then the computer will insert, or put in, the line just below your name. Let's try it, using a line numbered 15. (Fill in the blank with your age.)

Type: 15 PRINT "I AM _____ YEARS OLD"

Now check to see if the line was added to your program.

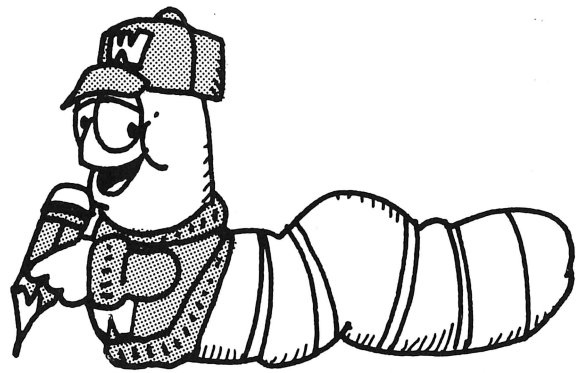
Type: LIST (press RETURN)

You will see that line 15 has been added to your program, right between lines 10 and 20! RUN your program again. This time the program line about your age will show up just where you want it to.

Getting to the Core

- Programs have line numbers, statements, and commands.
- The computer will RUN a program in numbered order.
- RUN tells the computer to follow the directions of the program.
- NEW tells the computer to erase any program in memory.
- LIST tells the computer to write out any program lines in memory.
- HOME clears the computer's screen.
- To delete, or erase, a line in a program, type the line number and press RETURN.
- To replace, or change, a line in a program, type the line number. Then type the new statement and press RETURN.

- To add a line to a program, type a new line number. Then type the new statement and press RETURN.



Paper and Pencil Exercises

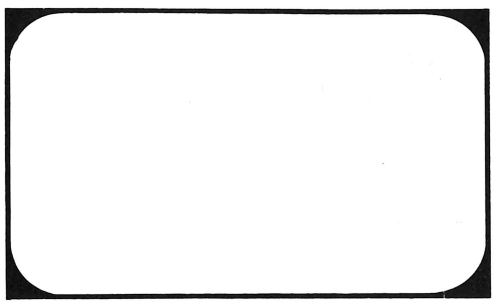
Write your answers in the blanks.

1. To erase the program from the computer's memory, type _____ .
2. To clear the screen, type _____ .
3. To make the computer follow the program instructions, type _____ .
4. To make the computer write the program in memory on the screen, type _____ .
5. To make the computer copy words, type PRINT and put the words inside _____ .
6. Every program line must have a line _____ at the beginning of it.
7. To delete, or erase, one line from a program, type the line _____ and press RETURN.

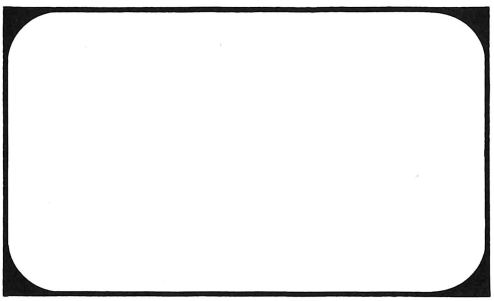
Computer Exercises

Pretend you are the computer. Write on each screen what will appear if someone typed what is shown. Then see if your answers are right. Type in the programs on your computer. Compare the computer's screen with your answers.

```
NEW
HOME
10 PRINT "TODAY"
20 PRINT "I AM GOING"
30 PRINT "TO A PARTY"
RUN
```

1. 

```
NEW
HOME
20 PRINT "MATH"
10 PRINT "I LIKE"
RUN
```

2. 

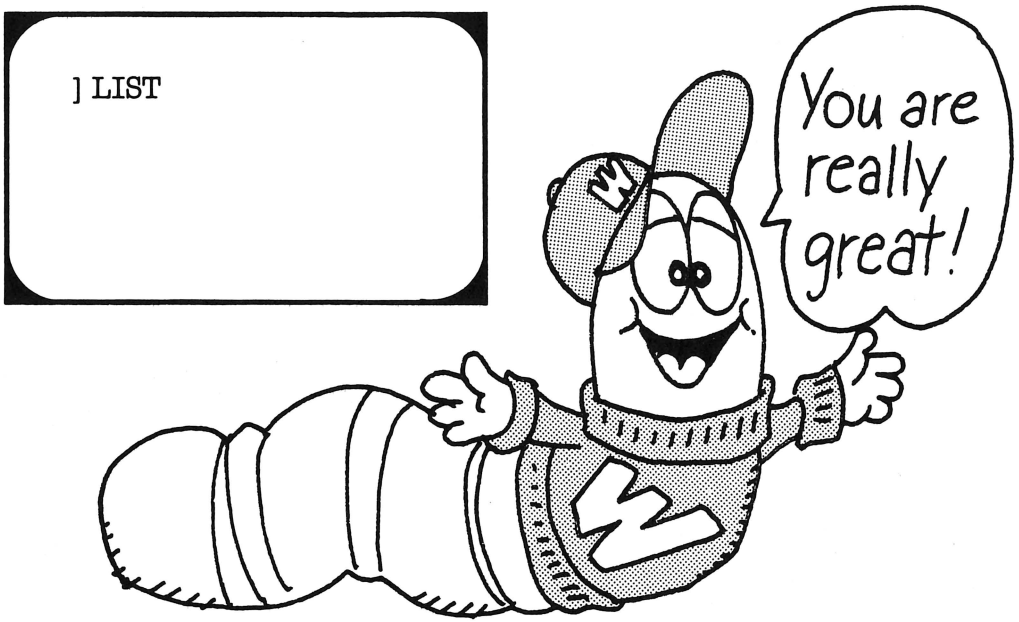
Type in the following program on your computer. Then type the statement or command for each direction below the program.

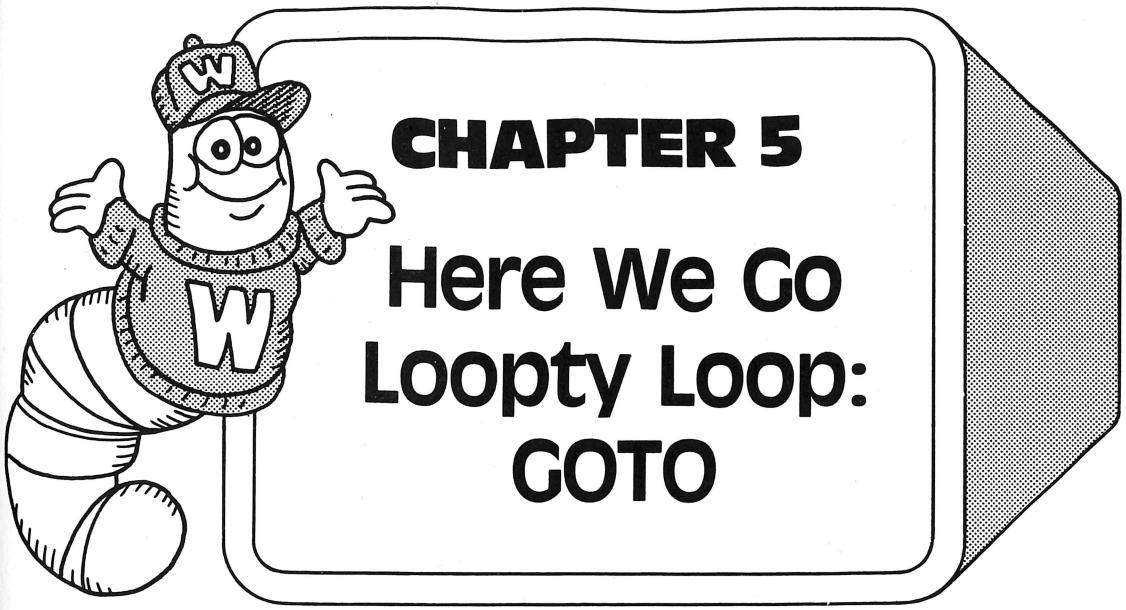
```
NEW
HOME
10 PRINT "MY LUCKY NUMBER IS"
20 PRINT 4
30 PRINT "MY NAME IS"
40 PRINT "WOZZY"
```

3. Clear the program from the screen (not from memory).
4. Have the computer do the program.
5. Have the computer write the program that is in memory.

6. Change line 20 so that the program will PRINT 7.
7. Delete lines 30 and 40.
8. Add a line 15. Have it PRINT the word NOT.
9. Have the computer do the program now.
10. Erase the program from memory.
11. Have the computer clear the screen and list what is now in memory.

If you followed all the directions, in order, your screen should look like this after the last direction:



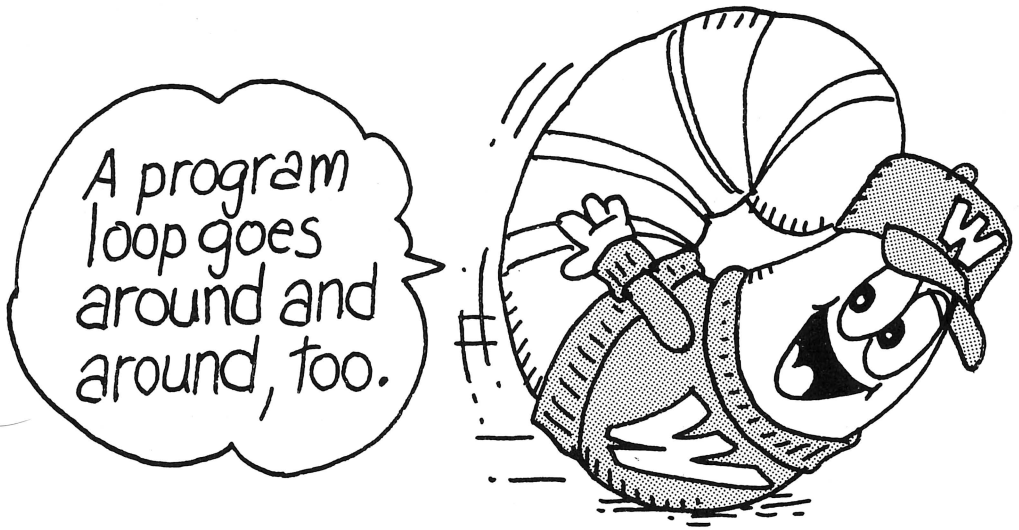


CHAPTER 5

Here We Go Loopty Loop: GOTO

Next you will learn how to put "loops" into your programs. Can you guess why a program might be called a loop?

```
10 PRINT "HELLO"
20 GOTO 10
```



Before you put a loop into your program, you should know how to stop it.

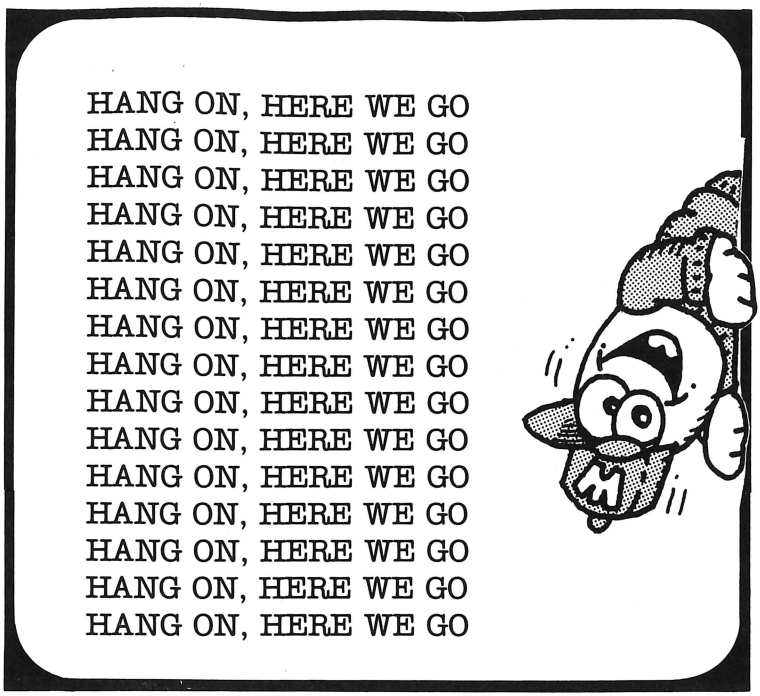
If you press both of these together and then release them, your program will stop.

The BASIC word that puts a loop into your program is GOTO. GOTO tells the computer to go to a line number and start the program from there. For instance, GOTO 10 tells the computer to go back to line 10 in the program.

Let's use GOTO in another program.

Type:
```
NEW
10 PRINT "HANG ON, HERE WE GO"
20 GOTO 10
RUN
```

Your screen should look like this:



Now stop the program. Hold down the CTRL (or CONTROL) key and press C.

Do you know why your program kept running until you pressed CTRL (or CONTROL) and C? Here's why. Remember, a computer always follows the direction in a program. Your program said:

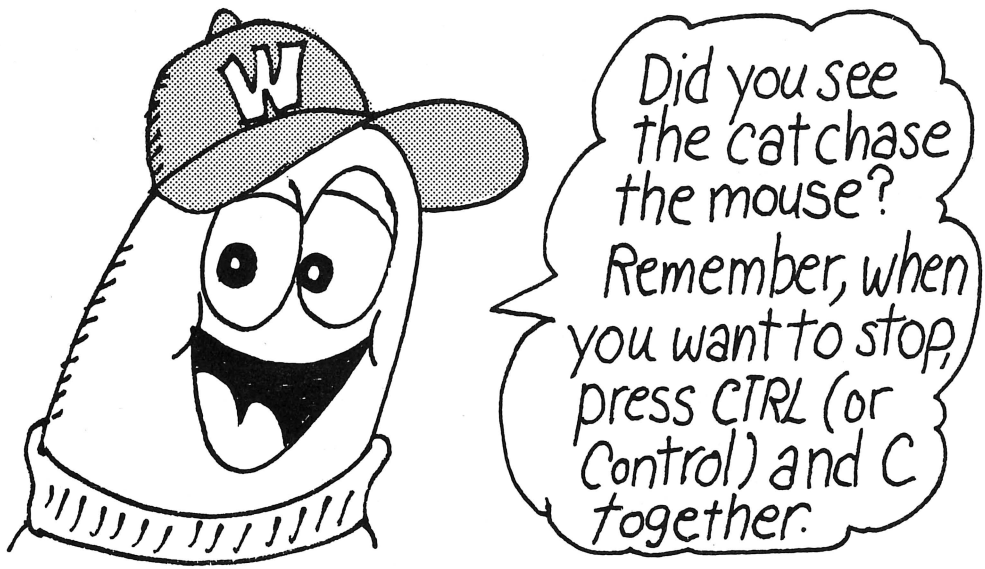
```
10 PRINT "HANG ON, HERE WE GO"
20 GOTO 10
```

The computer did just as it was told. First it printed HANG ON, HERE WE GO. Then line 20 told it to go back to line 10. So it did. It printed the same words again. Next it went to line 20 where it was told to go back to line. The computer kept "looping" back until you gave it the directions to stop.

```
NEW
10 PRINT "HANG ON, HERE WE GO"
20 GOTO 10
RUN
```

Here's one more program with a loop. (Remember to press RETURN after each line.)

Type:
```
NEW
HOME
10 PRINT "CAT"
20 PRINT "MOUSE"
30 GOTO 10
RUN
```



You can slow down the program by changing the Apple's speed. The normal speed is 255. You can use any number less than 255. Would you like to see the cat chase the mouse? Type in the following (no line number is needed):

```
SPEED = 100
```

Press RETURN and then type RUN.

Try some different speeds each time you stop the program. You can return the speed to normal by typing

SPEED = 255

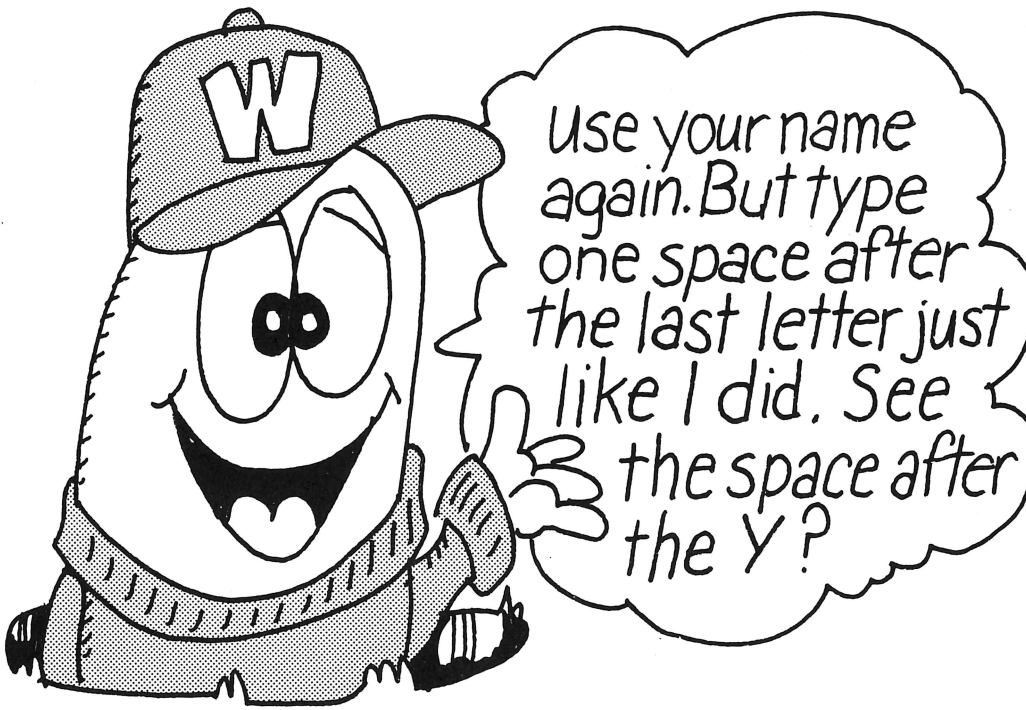
So far you have seen the words print down one column of your screen. How would you like to see your name printed all across the screen? To do this, you will use a semicolon (;). The ; goes at the end of the PRINT statement. It tells the computer to print the next word right after the last one. The computer will not skip a line or a space. When one line is filled, the computer will go on to the next line. To see the ; work, try this program:

Type:
```
NEW
HOME
10 PRINT "WOZZY";
20 GOTO 10
RUN
```

After your screen is filled with your name, press CTRL (or CONTROL) and C. Notice that there are no spaces between your names. The computer always prints just what is inside the " ". What if you want a space next to your name? Then you must put the space INSIDE the " ".

Change the program by typing a new line 10.

Type: 10 PRINT "WOZZY ";
RUN



Before we go on, here's a little hint that will make programming easier.

Instead of typing the word PRINT each time, you can use a ?. Your Apple reads the question mark (?) as the BASIC word PRINT. For example, the next two programs will print the same word. To get the ?, remember to press the SHIFT key.

```
10 PRINT "HELLO"

10 ? "HELLO"
```

You know that the semicolon (;) tells the computer to print a word right after the last word it has printed. The ; can do something else that is fun to try. The ; will move letters from one line up to another. Try this program:

Type:
```
NEW
HOME
10 ? "FAT";
20 ? "HER"
RUN
```

Did your Apple print the word FATHER? It should have. This happened because the ; after the word FAT told the computer to print the next word in the program, HER, on the same line. Notice that the ; is outside the quotation marks.

To see that your Apple understands the ? as PRINT, type LIST and you will see:

```
LIST
10 PRINT "FAT";
20 PRINT "HER"
```

Notice that all the ?s have turned into PRINTs!

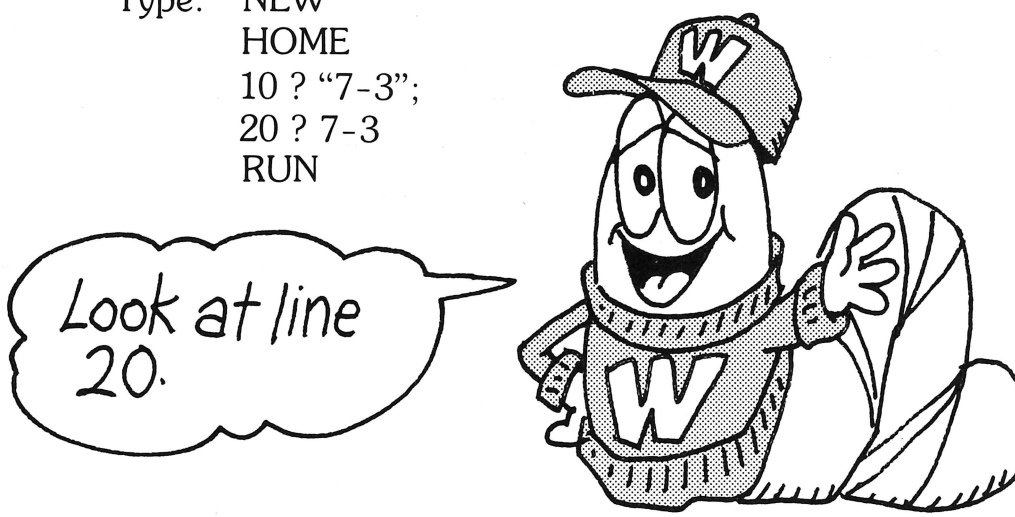
Here is another program for making new words.

Type:
```
NEW
HOME
10 ? "DO";
20 ? "NUTS"
```

Before typing RUN, can you guess what the new word will be? Type RUN (remember to press RETURN). Your Apple should print DONUTS.

Would you like to try another?

Type:
```
NEW
HOME
10 ? "7-3";
20 ? 7-3
RUN
```



Did you remember that a ? without " " tells the computer to do math?

There is one more mark that you should know how to use. It is the comma (,). The comma tells the computer to place all the letters and numbers you are typing into "zones" on the screen. Your Apple screen has three zones. Zones are like columns. If you try the next program, you will see where the zones are. Remember the comma (,) at the end of the PRINT statement.

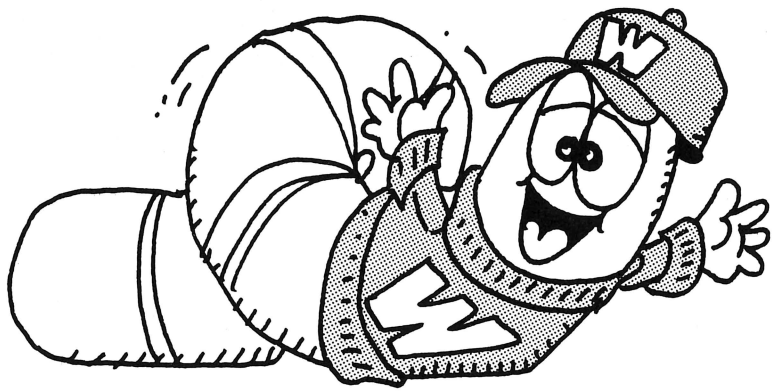
Type:
```
NEW
HOME
10 ? "ZONE",
20 GOTO 10
RUN
```

Press CTRL (or CONTROL) and C after the screen fills with the word ZONE. Now you can see the zones. Each column is a new zone. Remember, there are three zones on your screen.

Try this program so you can see the difference between a , and a ; in your program.

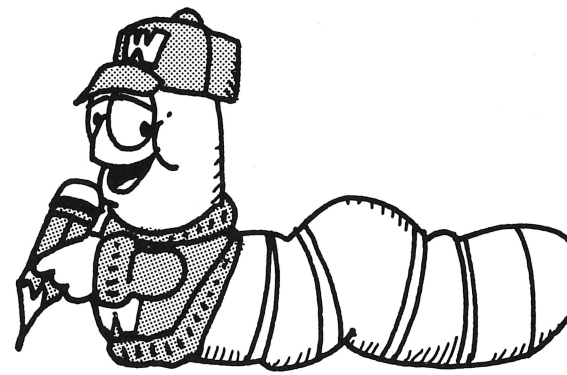
Type:
```
NEW
HOME
10 ? 1;2;3;4;5;6;7;8;9
20 ? 1,2,3,4,5,6,7,8,9
RUN
```

You have learned to make your computer do many things. Your computer will always follow your directions. Remember, you are the boss. Make your own programs using a ; or , . Can you tell the computer to help you with a math problem? Maybe you can think of a fun program for making your computer do a "loop."



Getting to the Core

- GOTO tells the computer to go back to a line in the program. For example, GOTO 10 tells the computer go to line 10.
- The semicolon (;) tells the computer to print the next symbol on the same line.
- The comma (,) tells the computer to print the next symbol in the next zone on the screen.
- The Apple has three zones.



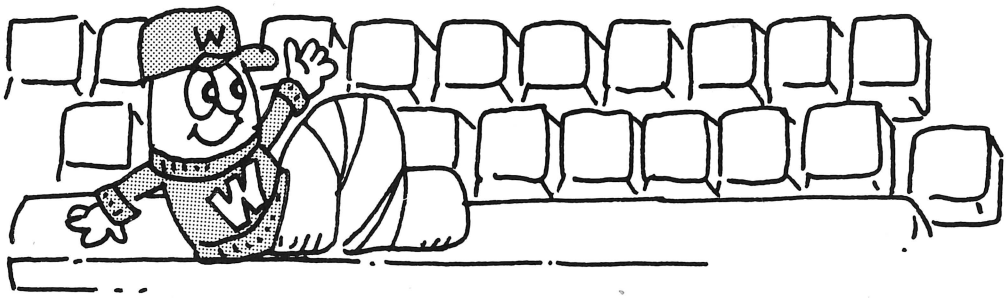
Paper and Pencil Exercises

Write your answers in the blanks.

1. If you want the computer to write words next to each other and on the same line, put a _____ at the end of the PRINT statement.
2. The statement that tells the computer to go back to another line is _____ .

3. When you put a , at the end of a PRINT statement, the next word will be printed in the next _____ .

4. The Apple has _____ zones.



Computer Exercises

Pretend you are the computer. Write on each screen what will appear if someone typed in what is shown. Then see if your answers are right. Type in the programs on your computer. Compare the computer's screen with your answers.

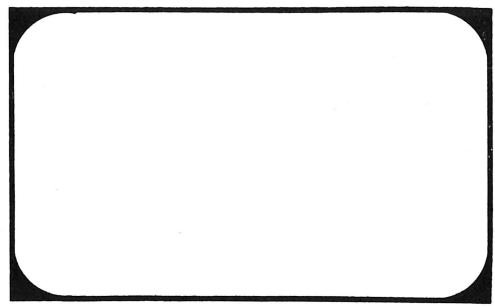
```
NEW
HOME
10 ? "MY NAME IS"
20 ? "ROGER REPEAT"
30 GOTO 10
RUN
```

1.

```
NEW
HOME
10 ? "I LOVE ";
20 ? "TO GO TO ";
30 ? "SCHOOL"
RUN
```

2.

```
NEW
HOME
10 ? "YOUR NAME ",
20 GOTO 10
RUN
```

3. 

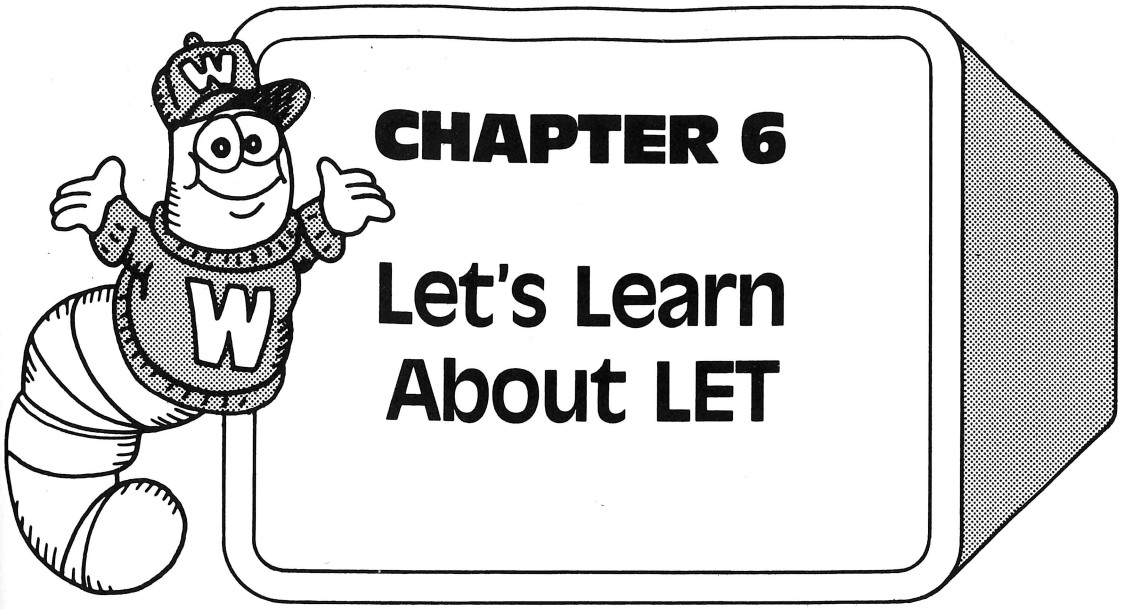
4. Type in a program that will do the following:

```
I'M GOOD AT MATH
5 * 6       30
I'M GOOD AT MATH
5 * 6       30
I'M GOOD AT MATH
5 * 6       30
```

5. Complete the following program so that the computer will print:

```
ONE     TWO     THREE
ONE     TWO     THREE
ONE     TWO     THREE
ONE     TWO     THREE
```

```
NEW
HOME
10 ? "ONE" ,
20 ? _____
30 ? _____
40 _____ 10
RUN
```

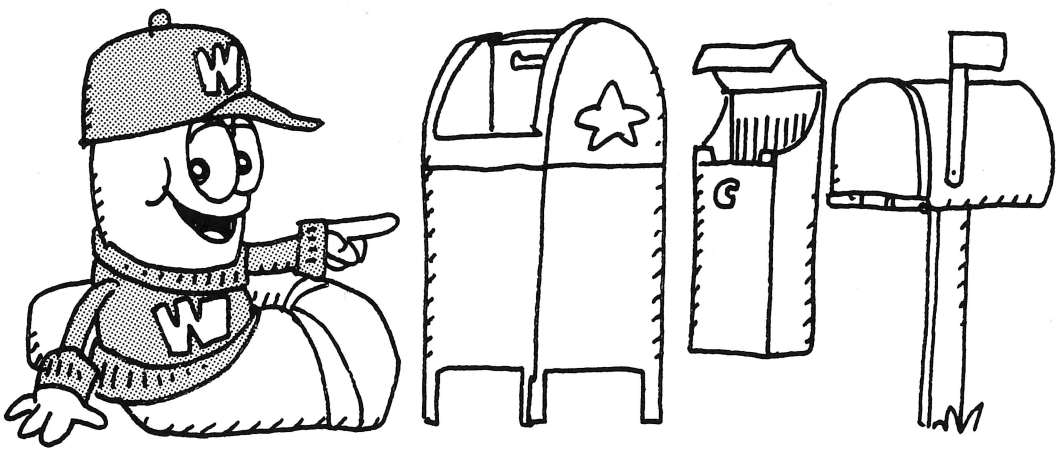


CHAPTER 6

Let's Learn About LET

Your Apple will do just what you tell it to if you talk in BASIC. Your computer will even think that numbers are letters if you give it the correct code. The letter A can equal 5, 6, 8, or any number value by using the BASIC word LET.

Here is how LET works. Think of the computer's memory as a set of mailboxes. Each mailbox will have a letter in it.



Suppose you want to make A equal the number 5. In your program you would type:

```
LET A=5
```

Presto! The computer puts the value of 5 into "mailbox" A in its memory. When you tell your Apple to PRINT A, guess what it prints? If you said 5, you are right.

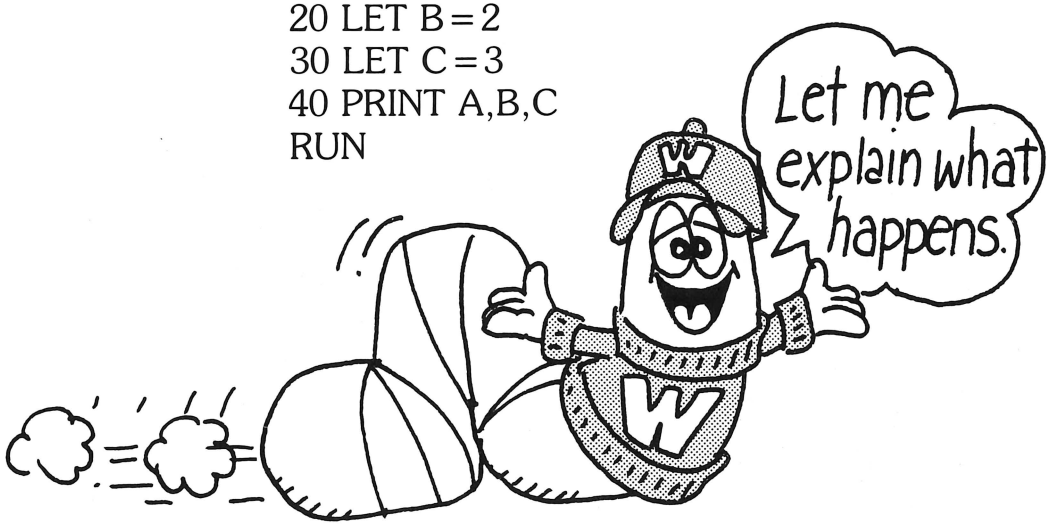
If you want to change the value of A, just type LET A=10 (or whatever number you choose).

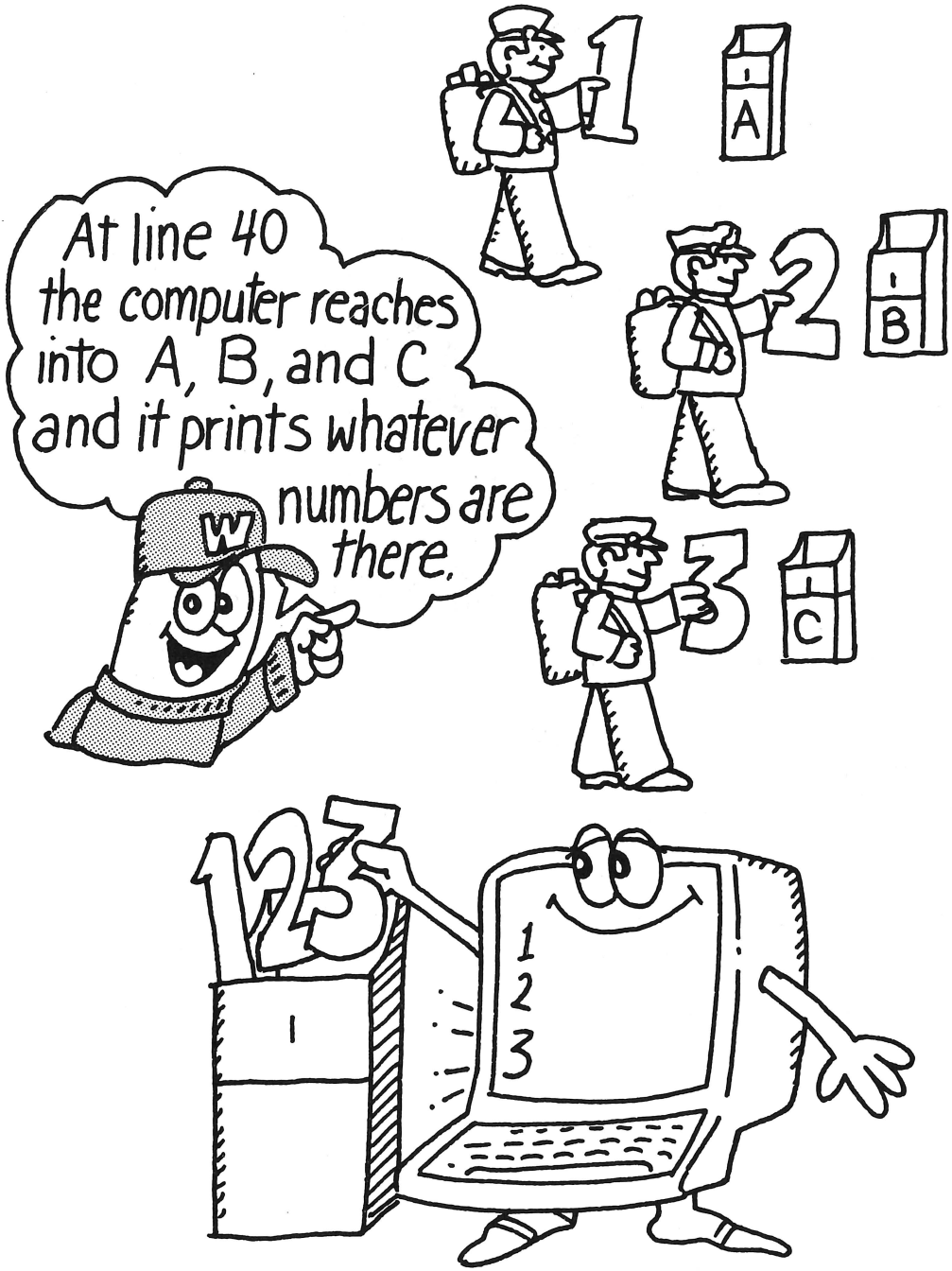
You can give number values to as many letters as you wish. Here are just a few:

```
LET A=8
LET AB=10
LET X=125
```

To see how LET works in a program, try the following program. (Notice that the letter is always on the left of the equal sign and the number is always on the right.)

Type:
```
10 LET A=1
20 LET B=2
30 LET C=3
40 PRINT A,B,C
RUN
```




At line 40 the computer reaches into A, B, and C and it prints whatever numbers are there.
1
2
3
A
B
C
123
1
2
3

Once you have given letters their number values, you can add, subtract, multiply, and divide with them. Read the program below and, with paper and pencil, see if you can work out the answer. Then enter the program.

Type:
```
NEW
HOME
10 LET A=5
20 LET B=3
30 ? A+B
RUN
```

Did you get the right answer? It's 8.

Type line 30 over again, changing the plus sign to a minus sign. RUN the program. Next type line 30 again and change the minus sign to the multiplication sign and RUN the program.

To change the value of a letter, just type the change of value into the program and the computer will immediately forget the last number and put the new number in the right mailbox. Watch.

Type:
```
NEW
HOME
10 LET A=1
20 LET B=2
30 LET C=3
40 LET A=4
50 ? A,B,C
RUN
```

Your screen should look like this:

```
10 LET A = 1
20 LET B = 2
30 LET C = 3
40 LET A = 4
50 ? A,B,C
] RUN
4             2             3
```

Do you know why the computer printed 4 first? The computer remembered the last value that you gave A. Look at line 40.

If you do not give a value to a letter, the computer will assign the letter a value of 0.

Type: NEW
HOME
10 ? A,B,C,
RUN

Notice, you did not give A, B, or C any value in the program. Your Apple computer gave each the value of 0.

Here is a program that will write out a whole problem for you. Read the program before you RUN it and notice how ; and " " are used.

Type:
```
NEW
HOME
10 LET A=6
20 LET B=3
30 ? A; "*"; B ; "      " ; A*B
RUN
```

Your screen should look like this:

```
10 LET A=6
20 LET B=3
30 ? A;"*";B;"      ";A*B
RUN
6*3     18
```

Now try giving different values by changing lines 10 and 20.

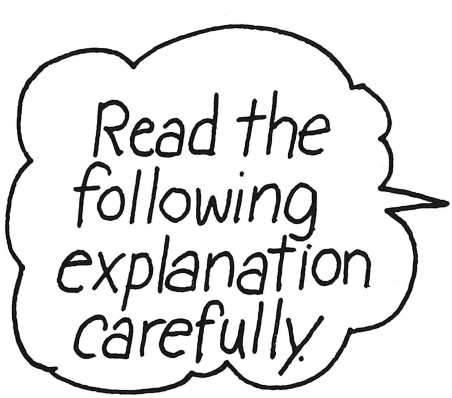
Remember, to change a line, type the line number and the new statement that you want.

Here is another program using LET. Use this program whenever you need to use the same number several times.

Suppose your family spends $120 a week for food and you want to know how much food will cost for a day, a month, and a year.

Type in this program:

```
NEW
HOME
10 LET A = 120
20 ? A/7,A*4,A*52
RUN
```



A/7 means 120 divided by 7 (there are 7 days in each week). This will tell you how much is spent on food each day.

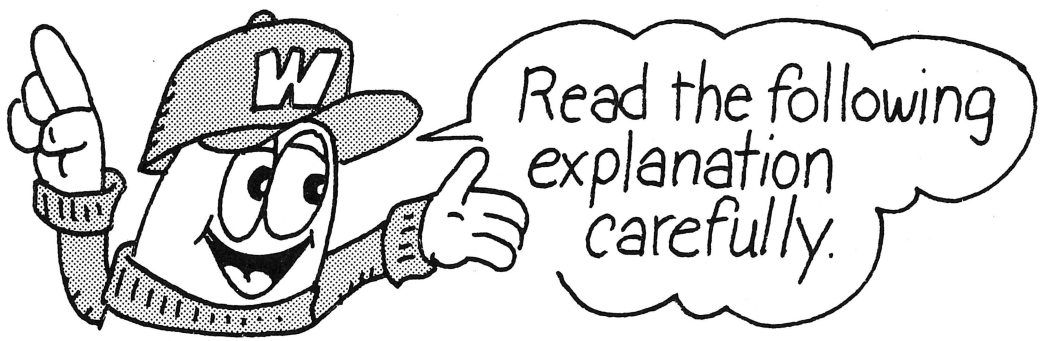
A*4 means 120 times 4 (there are 4 weeks in each month). This will tell you how much is spent on food each month.

A*52 means 120 times 52 (there are 52 weeks in each year). This will tell you how much is spent on food for a whole year.

Here is a fun program for you to try. It uses all the BASIC words you have learned. This program is called "a counting loop." Read through the program before you try it. Can you guess what it will do)?

Type:
```
NEW
HOME
10 LET N=1
20 ? N
30 LET N=N+1
40 GOTO 20
RUN
```

Remember how to stop a loop? Press CONTROL (or CTRL) and C. (Remember how to change the speed?)



Line 30 is the counter line. It adds 1 to the value of N each time the program passes line 30.

Try a small change in the program. Can you guess what will happen before you RUN the program?

Type: 20 ? N,
RUN

Do you know why the numbers appeared in columns?

Would you like to try some other changes? You can make the program count by fives or tens by changing the number added to N in line 30.

Remember, you have not typed in NEW. Do you know why? It's because you are changing the program. NEW will erase the entire program.

Getting to the Core

- LET tells the computer to let a letter (or letters) equal a number.
- You can give a number value to any letter you choose.
- Always place the letter to the left of the equal sign and the number to the right.

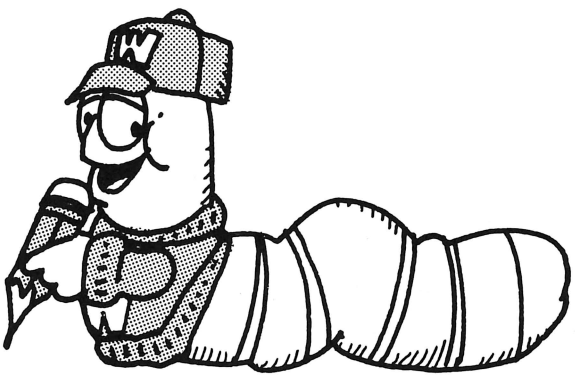
  Example: LET A = 12
  LET B = 4

- After you give letters their number values, you can make the Apple solve mathematical equations.

Example:
```
10 LET A=4
20 LET B=3
30 ? A;" + ";B;"      ";A+B
RUN
```

Your screen should show:

```
4 + 3    7
```



Paper and Pencil Exercises

Write your answers in the blanks.

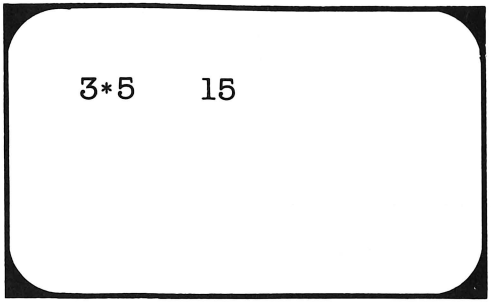
1. Read the following program and think about what it will do.

```
10 LET M=10
20 LET T=5
30 ? M,T
RUN
```

Line 30 in this program will print _____ .

2. Complete the following program so that it will RUN as shown on the screen.

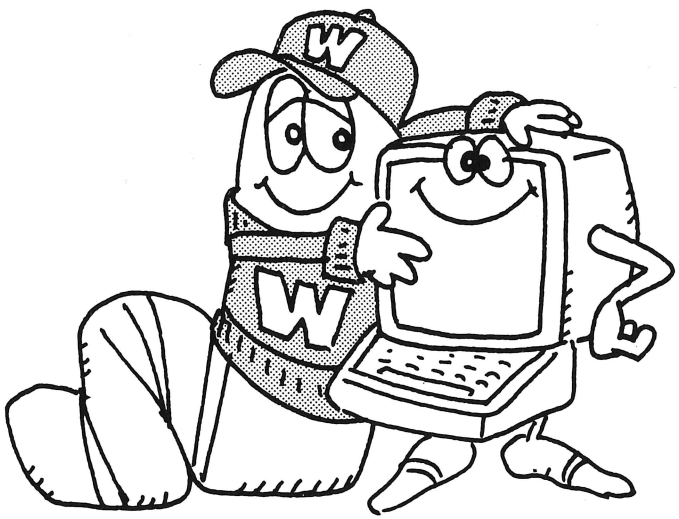
```
10 LET _____ =3
20 LET _____ =5
30 ? A;"*";B;"      ";A*B
```



3 When you give a letter a number value, the _____ goes on the right side of the = sign.

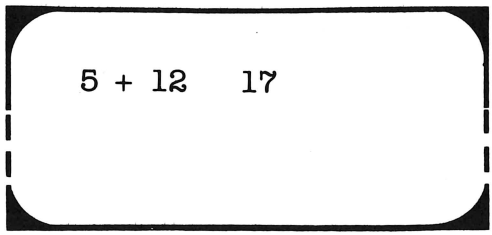
4. In LET statements, the letter goes on the _____ side of the = sign.

5. If you say LET A=10, the value of _____ is put into the A mailbox in the computer's memory.



Computer Exercises

1. Study the following program. There is at least one mistake in each line. Write the program correctly. You must correct the mistakes (debug) the program. Then type the new program into the computer, RUN it, and check to see if your screen shows:



Here is the program with mistakes.

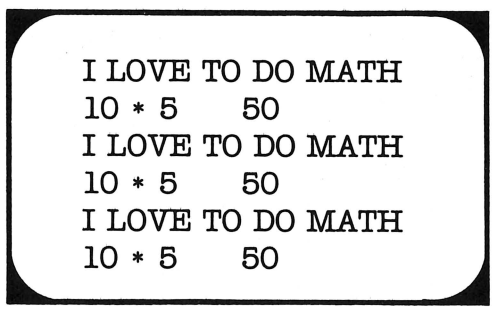
```
10 LET 5=Y
20 LET 12=X
30 ? Y;      ;X;"      ";Y*X
```

10 _____

20 _____

30 _____

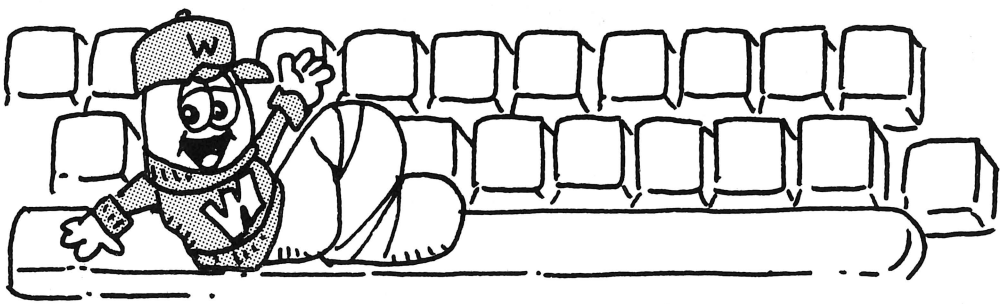
2. This is an incomplete program. Look at the picture of the screen to see what it should look like when the program has been entered correctly. Complete the program. Then RUN it and check your completed program against the screen.

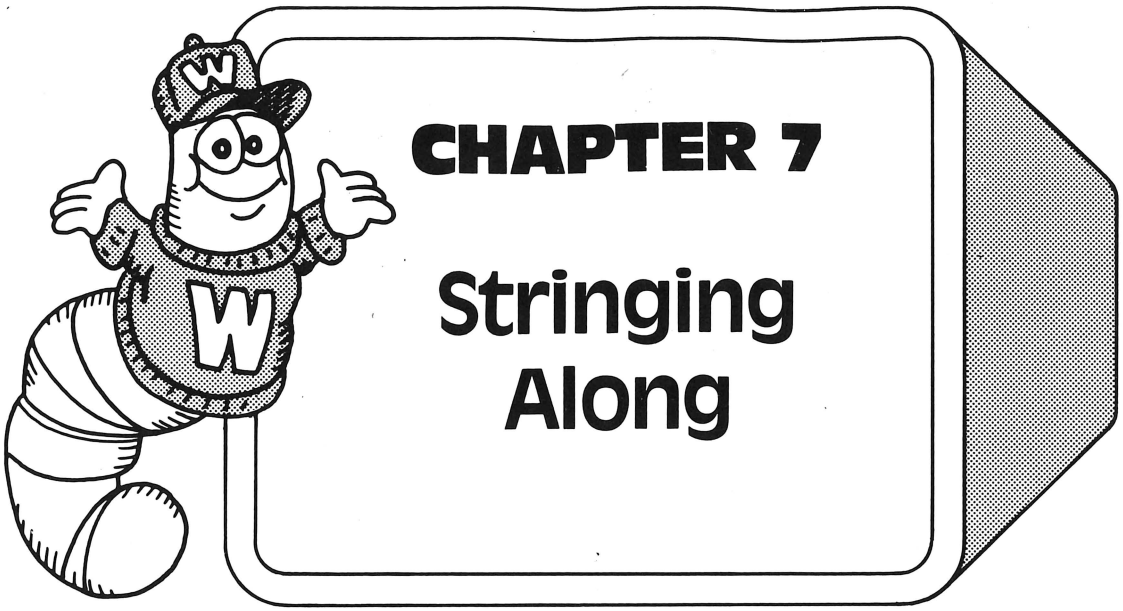


10 ? "I LOVE TO DO _____ "
20 LET C = 10
30 LET D = 5

40 ? _____

50 _____ 10
RUN





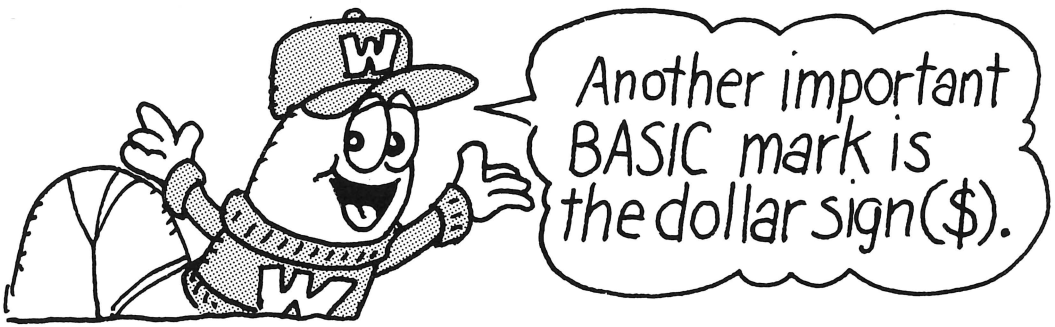
CHAPTER 7

Stringing Along

BASIC is a fun language. You have used it to make a letter equal a number.

Up to now, you have used the word LET when giving a letter a value. Your Apple will understand what you mean even if you don't use the word LET. For example, you may use LET A = 20 or A = 20. Both statements are the same to the Apple.

Now that you understand what LET means, you can take the shortcut and just use A = 20.



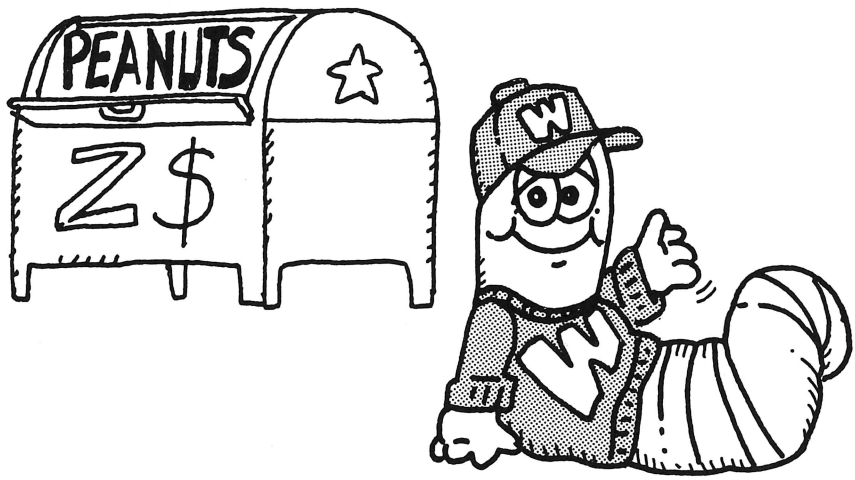
With $ you can make a letter stand for symbols, words, or even whole sentences. Let's make the letter Z stand for the word PEANUTS. To do this, put a $ after Z.

In a program, you would type:

Z$ = "PEANUTS"

It is also important that you put the quotation marks around the word PEANUTS. These quotation marks are very important.

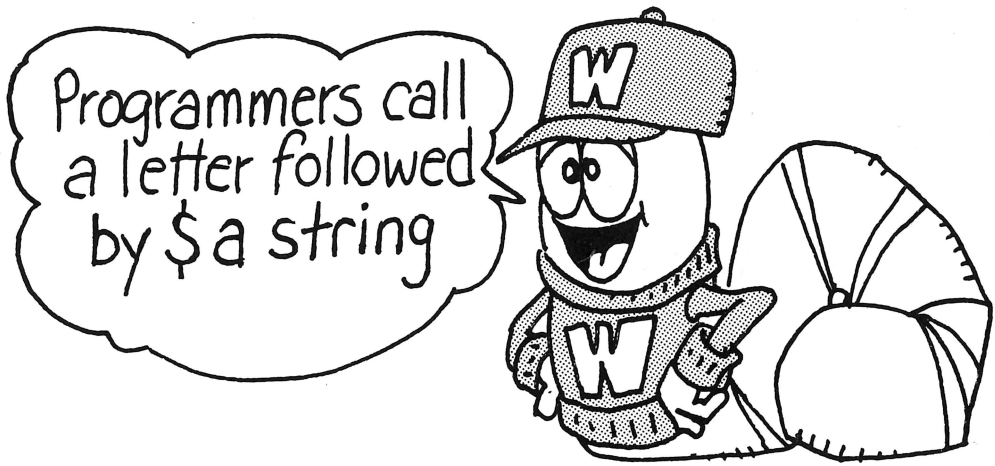
When you type Z$ = "PEANUTS" you are telling your computer to put the word PEANUTS inside its mailbox called Z. The $ lets the computer know it is going to put letters instead of numbers in the mailbox.



If you tell the Apple to PRINT Z$, you will see PEANUTS on the screen. Try the following program.

Type:
```
NEW
HOME
10 Z$ = "PEANUTS"
20 ? Z$;
30 GOTO 20
RUN
```

Wow! There are a lot of PEANUTS. Remember how to stop the loop? Press CTRL (or CONTROL) and C.



You can make a string equal to whatever you would like. Remember, you are the boss. Just be sure to always put the words or symbols inside quotation marks. Here are some examples of strings.

```
A$="% * & "
AB$="GOOD MORNING EVERYONE"
D$="MY NAME IS WOZZY"
```

Look at the next program, which uses strings. It is one of Wozzy's favorites. Would you like to try it? First read the program and guess what will happen.

Type:
```
NEW
HOME
10 A$="THE EARLY BIRD MISSES "
20 B$="THE WORM"
30 ? A$;
40 ? B$
RUN
```

Here is another program using strings.

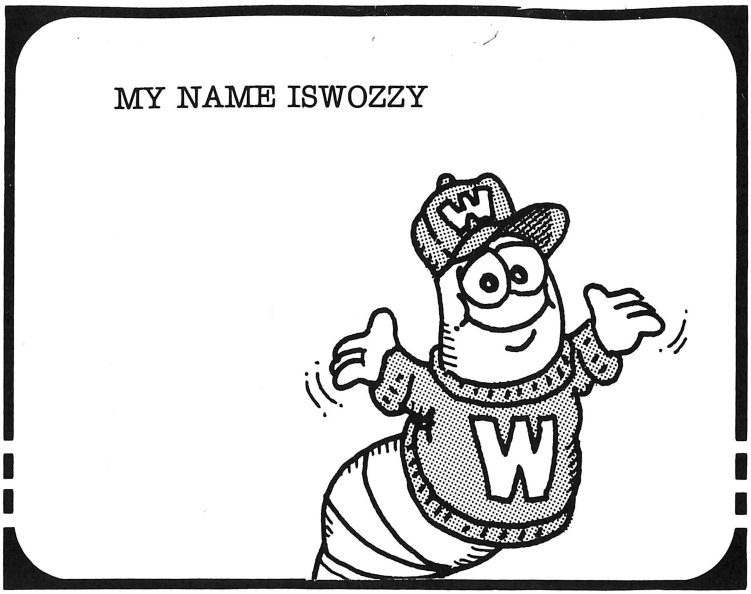
Type:
```
NEW
HOME
10 C$="MY NAME IS "
20 D$="WOZZY"
30 ? C$,D$
RUN
```

Your screen should look like this:

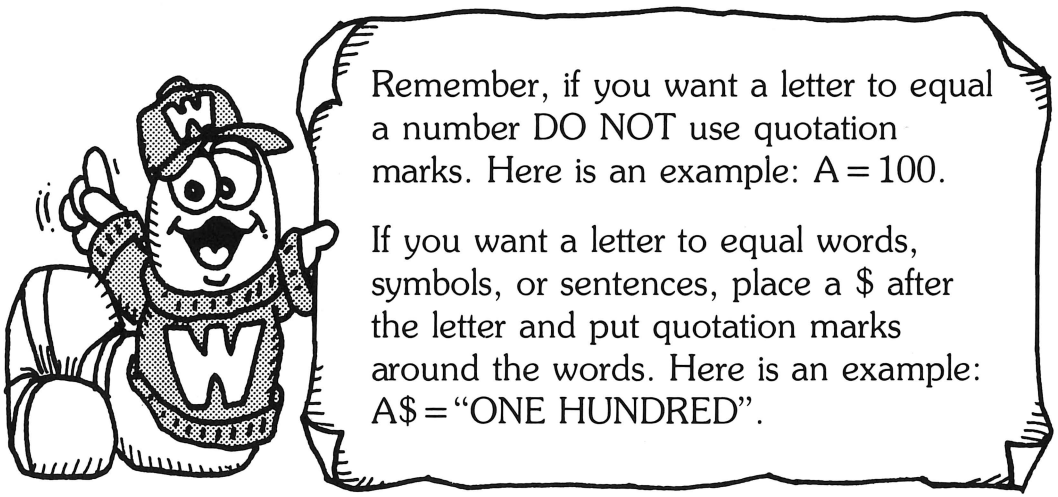
```
MY NAME IS                WOZZY
```

Do you know why your name is all the way to the right? It's because of the comma in line 30. Now try typing line 30 again. This time type in a ; in place of the comma. Your screen will still read MY NAME IS WOZZY. But the word WOZZY will be only one space away from the word IS.

If your screen looks like this:

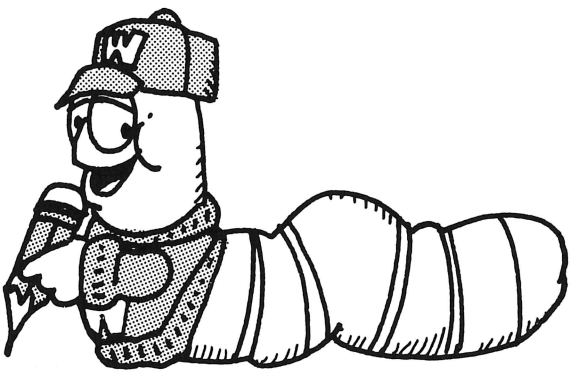


check line 10. Be sure there is a space after the word IS.


Remember, if you want a letter to equal a number DO NOT use quotation marks. Here is an example: A = 100.
If you want a letter to equal words, symbols, or sentences, place a $ after the letter and put quotation marks around the words. Here is an example: A$ = "ONE HUNDRED".

Getting to the Core

- To let a letter equal words, symbols, or sentences, write a $ after the letter and put " " around the words or symbols. Here is an example: A$ = "COMPUTERS".
- Letters followed by a $ are called strings.
- When you tell your Apple to PRINT A$, the computer will go into the mailbox called A$ and print whatever words, symbols, or sentences are there.



Paper and Pencil Exercises

Write your answers in the blanks. You can use any letters or strings you choose. Just be sure to use only letters for numbers and add the $ for words or symbols.

1. _____ = 43
2. C$ = "_____"
3. Y = _____
4. _____ = "I LIKE BASIC"

5. _____ = 3 * 2

6. _____ = "* * * * * * * * *"

7. _____ = 10000

8. M$ = "_____"

Computer Exercise

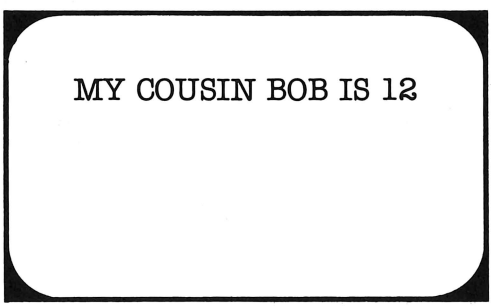
1. Read this incomplete program. Then fill in the blanks. Your answers should make the program do what is on the screen. To see if your answers are right, type the program into your computer.

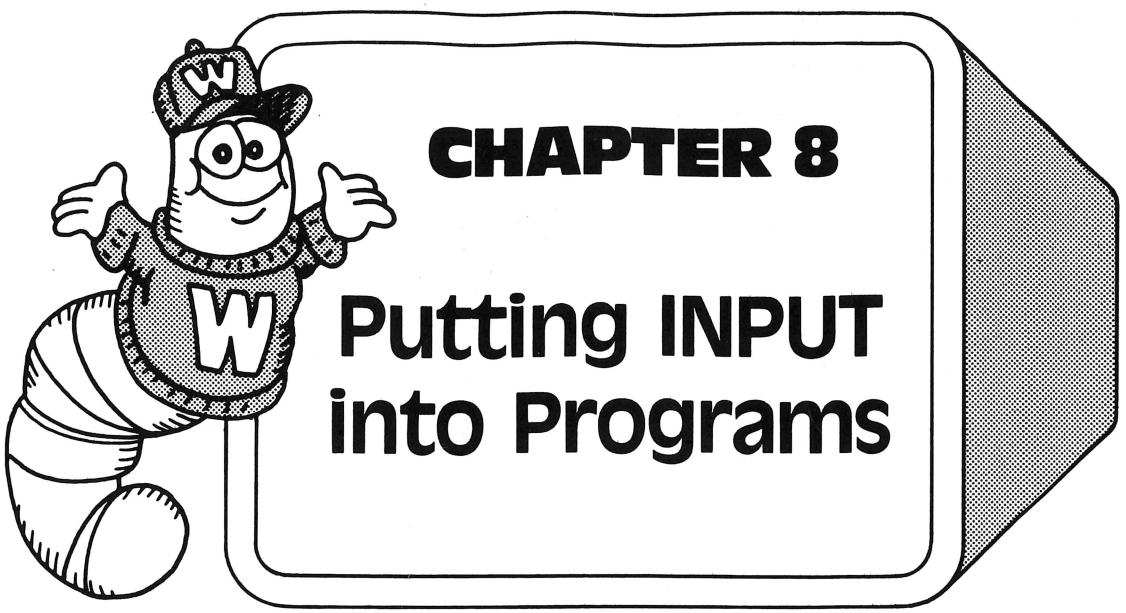
```
NEW
HOME

10 A$ = _____

20 B = _____

30 F$ = _____
40 ? A$;F$;B
RUN
```





CHAPTER 8

Putting INPUT into Programs

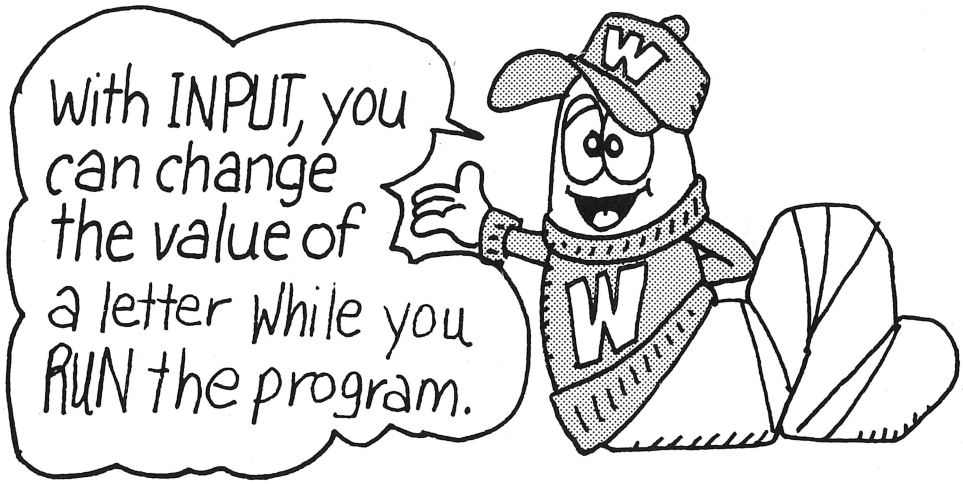
In Chapters 6 and 7, you gave different values to letters and strings. Each time you wanted to change the value, you had to rewrite the program. Example:

```
10 A=4
20 ? A
RUN
```

This program puts the value of 4 into mailbox A. If you want to change the value of A, you must rewrite line 10. If you want A to have the value of 7, then line 10 must say:

```
10 A=7
```

You are now ready to learn a faster way to change values within the BASIC language. You are going to use the INPUT statement.



In this chapter, we will use INPUT with numbers.

INPUT tells the computer to wait for an answer. Read the following program and see how INPUT works.

Type:
```
10 ? "WHAT IS A"
20 INPUT A
30 ? A
```

Look at line 20. When the computer sees INPUT, it stops and puts a question mark ? on the screen. At this point, you type in a value and press RETURN. Pretend here that you have typed in 42. You can see it on the screen.

```
WHAT IS A
?42
42
```

Look at line 30. Here you are telling the computer to print the value that you have given A. The 42 that you now see is what the computer found when it looked into mailbox A. The computer then printed that value on the screen.

After you RUN this program once, RUN the program again. Now you can change the value when the ? appears on the screen.

Type: RUN

```
WHAT IS A
?20
20
```

Remember, if you are giving a value to a letter without a $, your value must be a number. Look at line 10 in the sample program. It is a PRINT statement that asks for a value of A. This is important. It lets you know what to type when you see the ? on your screen.

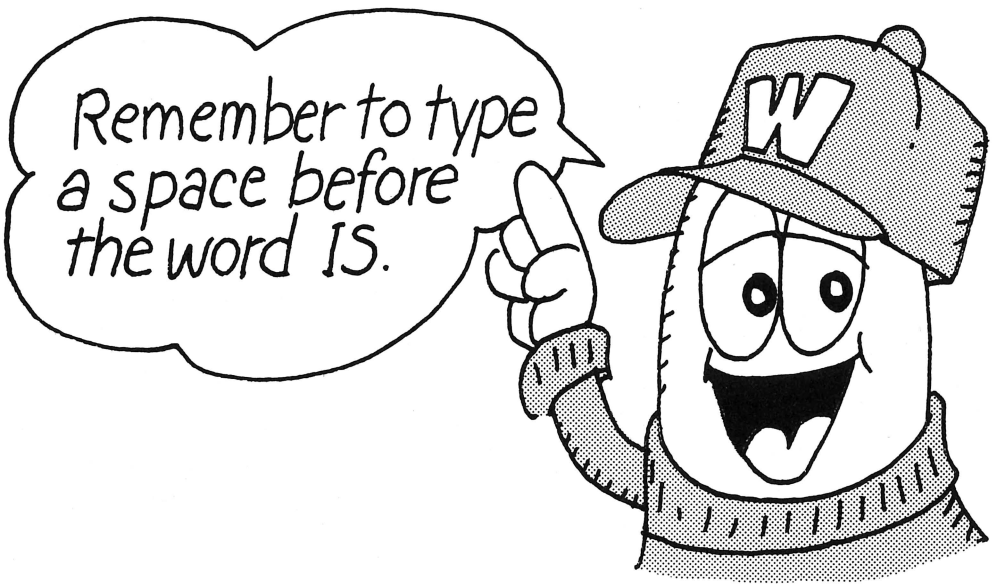
RUN the following program. It does not have a PRINT statement before the INPUT statement.

Type:
```
NEW
10 INPUT A
20 ? A
RUN
```

All you see on your screen is a ?. When other people RUN this program, they will not know what to do. Always put a PRINT statement in your program that tells what INPUT you want.

Now try this program:

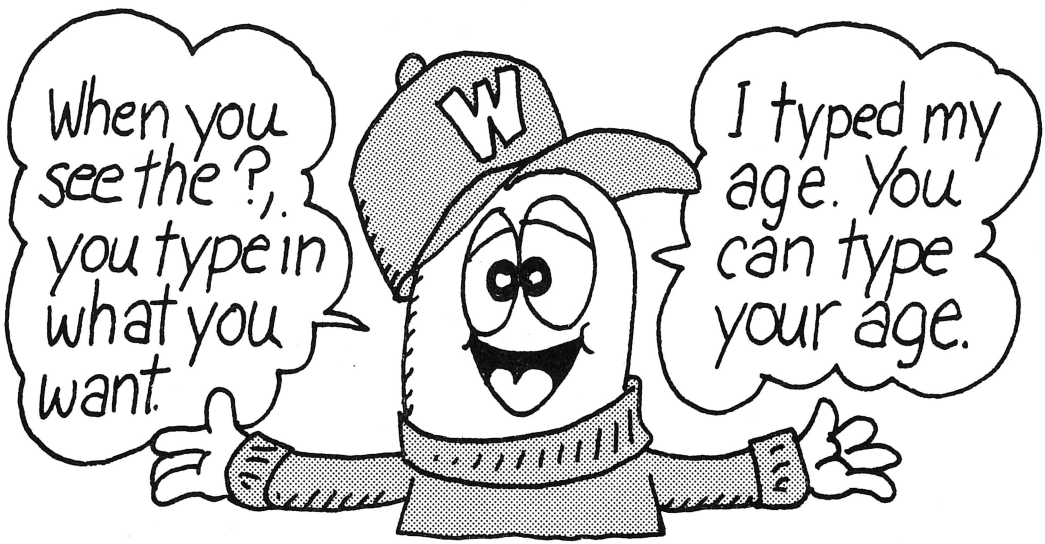
Type:
```
NEW
HOME
10 ? "HOW OLD ARE YOU"
20 INPUT A
30 ? A;" IS A VERY NICE AGE"
RUN
```



Your screen should look like this:

```
HOW OLD ARE YOU
?

9 IS A VERY NICE AGE
```



Do you know where the 9 in the last line came from?

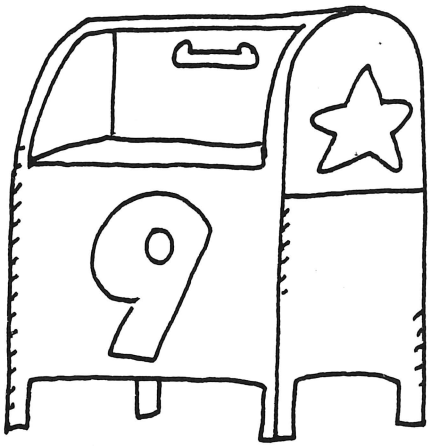
Now let's look at the program again.

Type: LIST

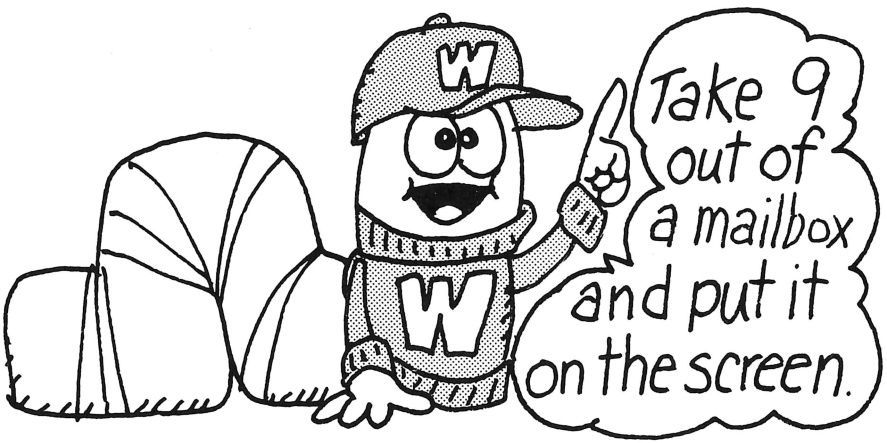
You will see the program:

```
10 PRINT "HOW OLD ARE YOU"
20 INPUT A
30 PRINT A;" IS A VERY NICE AGE"
```

When the computer reached line 20, you typed in your age. The computer put that number into a mailbox A.



At line 30 the program says PRINT A. The computer went into mailbox A and put whatever was stored there on the screen.



Now RUN your program again.

Type: RUN

This time type a different age. Here is what will happen if you type 14.

Now let's get ready to add a new line to this program.

Type: HOME
Type: LIST

You should now have a listing of the program on your screen. Now add line 40.

Type: 40 GOTO 10

Do you know what will happen? RUN the program to see.

Type: RUN

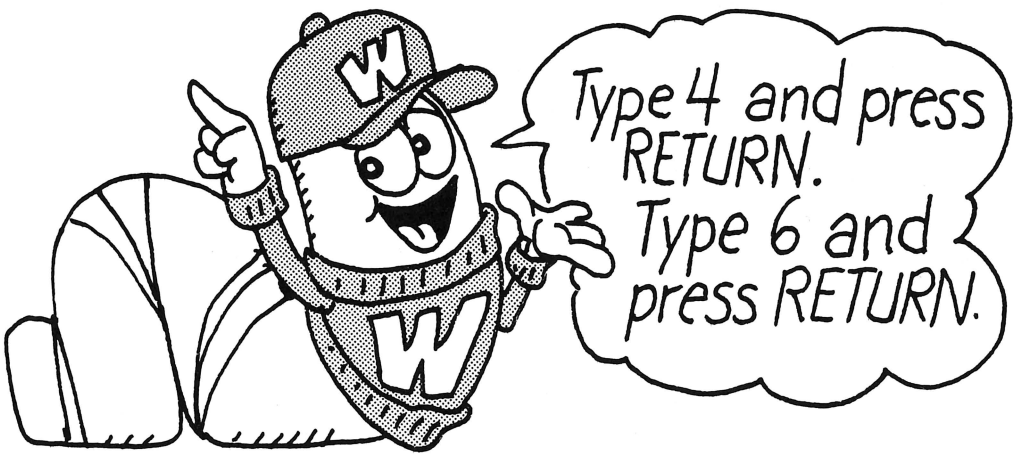
Each time you answer the question "HOW OLD ARE YOU" the program goes back to the start.

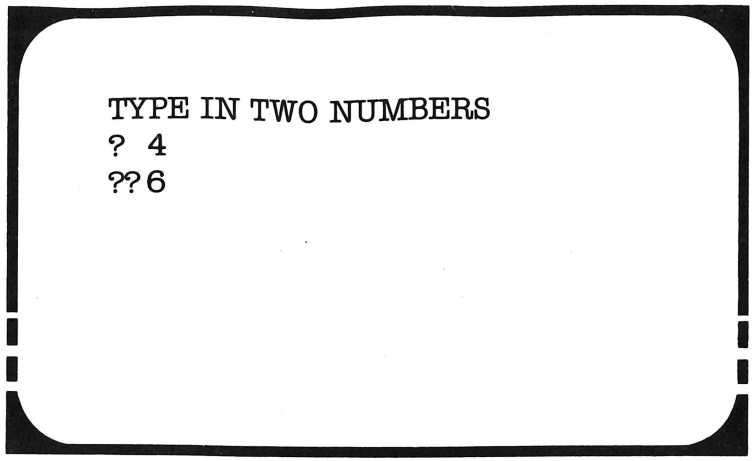
Before you can go on to a new program, you must stop this one. Press CONTROL (or CTRL) and C and press RETURN. Type NEW and HOME and you will be ready to write a new program.

Now we will write a program using TWO letters in your INPUT statement. There are two ways to do this. Try the following program.

```
Type:  NEW
       HOME
       10 ? "TYPE IN TWO NUMBERS"
       20 INPUT A,B
       30 ? "A IS ";A
       40 ? "B IS ";B
       RUN
```

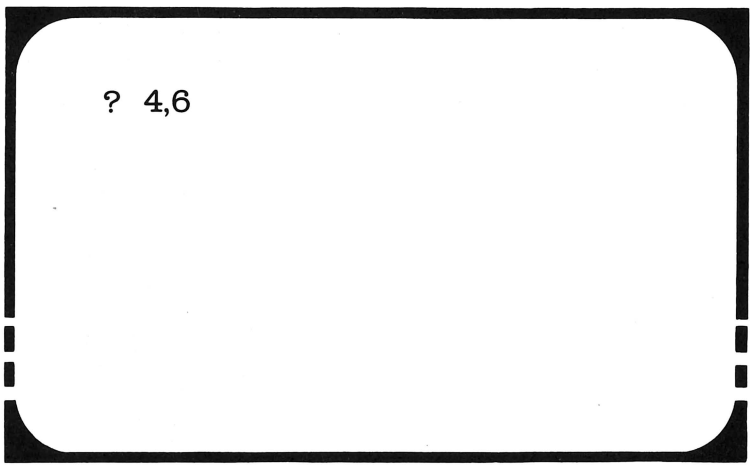
The first time you RUN the program, do this:





A has the value of 4.
B has the value of 6.

Now RUN this program again. This time after the ? type in two numbers on the same line separated by a comma.



Now RUN the program a few more times. Type in different numbers both ways. See what happens.

Here is a very helpful program using INPUT. Read the program first. See if you can guess what the program will do. Type in the program and then RUN it to see if you are right.

Type:
```
NEW
HOME
10 ?"WHAT TWO NUMBERS SHOULD I ADD"
20 INPUT N,P
30 ? N;" + ";P;" = ";N + P
RUN
```

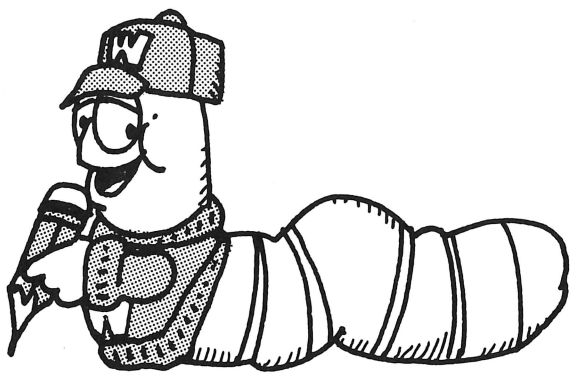
Notice that the letters in the INPUT statement in line 20 are the same letters used in the PRINT statement in line 30.

RUN this program a few times. Change your answers to the INPUT each time. Then you can even try changing the program! Can you make the computer multiply some numbers for you?

Getting to the Core

- INPUT tells the computer to wait for an answer.
- When the computer comes to an INPUT, a ? will appear on the screen.

- If you write INPUT A and answer the ? with 4, the value 4 is put in mailbox A.
- Always press RETURN when you type an answer to the ?.
- If you want two numbers to be entered with one INPUT statement, use a comma between the letters you use in the INPUT statement. Here is an example: INPUT A,B.
- To answer an INPUT statement that uses letters, type numbers only.



Paper and Pencil Exercises

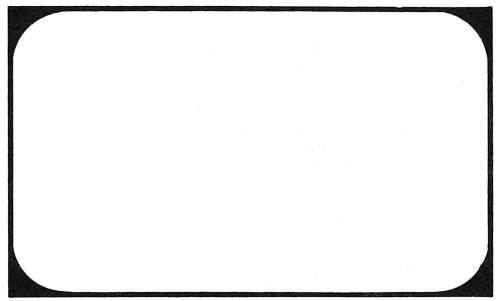
Write your answers in the blanks.

1. A statement that lets the computer ask you a question and wait for an answer is the _____ statement.
2. When the computer comes to the INPUT statement, a _____ will show on the screen.
3. If your INPUT statement is INPUT plus a letter (for example: INPUT D) the answer must be a _____ .
4. After you type in your answer to the INPUT, always press _____ .
5. You can have the program ask the same question over and over by putting a _____ statement in the program.

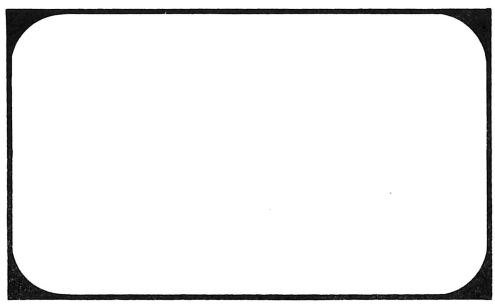
Computer Exercises

Pretend you are the computer. Write on each screen what will appear if someone typed in what is shown. Pretend the person answered 5 in both programs.

```
NEW
HOME
10 ? "HOW MANY DAYS IN A WEEK"
20 INPUT D
30 ? "YOUR ANSWER WAS ";D
40 ? "THE RIGHT ANSWER IS 7"
RUN
```

1. 

```
NEW
HOME
10 ?"HOW MANY FRIENDS DO YOU HAVE"
20 INPUT F
30 ?"YOU HAVE ";F;" FRIENDS"
RUN
```

2. 

Answer the questions about the following program.

```
10 ?"TYPE IN TWO NUMBERS"
20 INPUT A,B
30 ?"THE NUMBERS YOU CHOSE WERE ";A;" AND ";B
40 ?"IF YOU ADD ";A;" AND ";B
50 ?"THE ANSWER IS ";A+B
60 GOTO 10
RUN
```

3. What is the first thing that will appear on the computer when this program is run? _____

4. How many numbers must you type in when the program is run? _____

5. What will this program do with the numbers that you type in?

   _____

6. Using the numbers 6 and 7, what will show on the screen when the computer gets to line 30? _____

7. Using the numbers 6 and 7, what will show on the screen when the computer gets to line 40? _____

8. Using the numbers 6 and 7, what will the computer show on line 50? _____

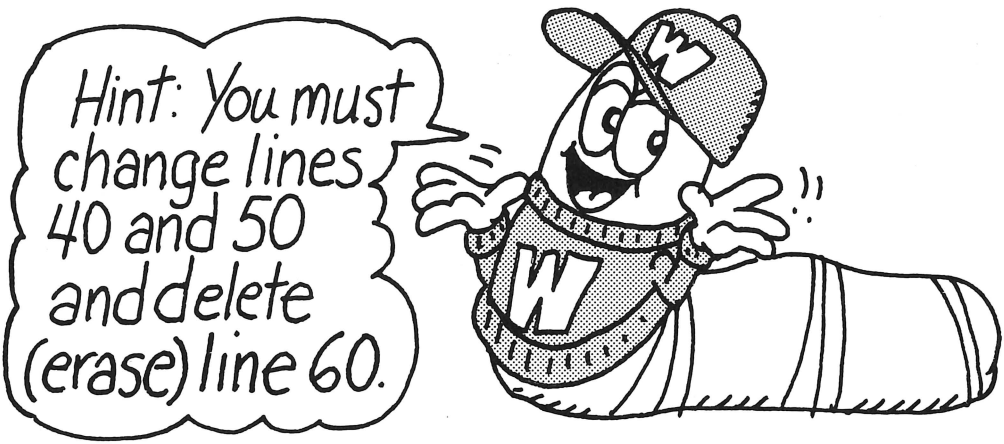
9. What will line 60 do to this program? _____

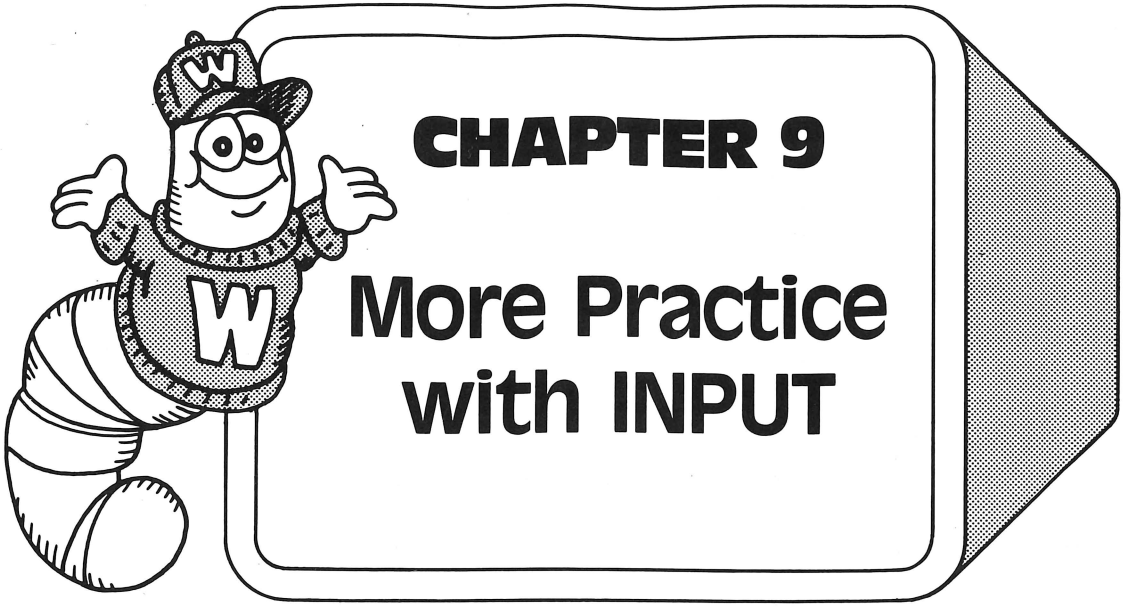
10. How can you stop this program? _____

11. Now type in the program. See if your answers to questions 3 through 10 are right.

12. Change the program to get the following on your screen. (You must type 6 and 7 as answers to INPUT statements when you RUN the program.)

```
TYPE IN TWO NUMBERS
?
THE NUMBERS YOU CHOSE WERE 6 AND 7
IF YOU MULTIPLY 6 AND 7
THE ANSWER IS 42
```





CHAPTER 9

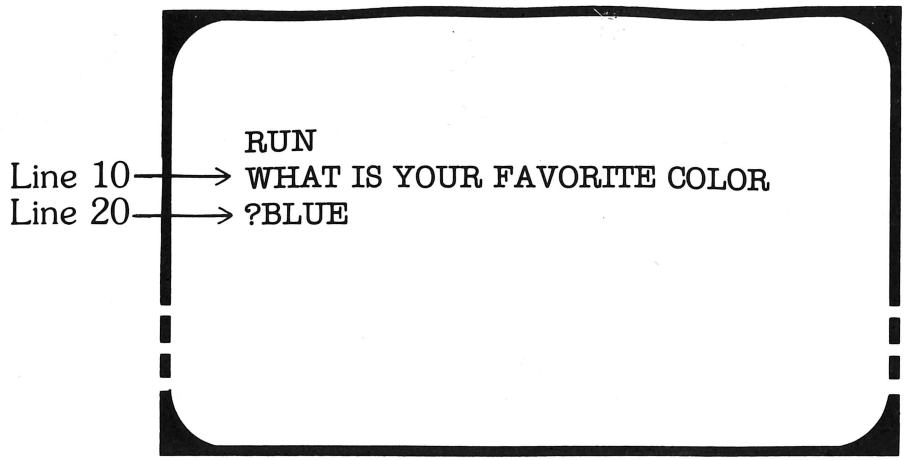
More Practice with INPUT

So far you have used INPUT with number values. But INPUT can also be used with strings. (Remember strings? If not, see Chapter 7 for a review.)

Here is a program using INPUT with the string A$. Type in the program. Then RUN it three times or more. Give a different answer each time you RUN the program. Don't forget to press RETURN when you INPUT your answer.

Type:
```
NEW
HOME
10 PRINT "WHAT IS YOUR FAVORITE
   COLOR?"
20 INPUT A$
30 PRINT A$;" IS A PRETTY COLOR"
RUN
```

Here is what each line does in the program.



When you answer the INPUT and press RETURN, BLUE goes into the A$ mailbox. Then the computer goes into the mailbox and prints out what is there in place of A$ in the PRINT statement.

Each time you RUN the program and INPUT a new color, you change what is in A$. The computer will always use the last value that you give to A$.

Here is another program. This one has two strings. And it has HOME in line 10. This will clear the screen each time you RUN the program.

Type:
```
NEW
10 HOME
20 PRINT "GIVE ME TWO WORDS THAT
   CAN BE JOINED TOGETHER"
30 INPUT A$
40 INPUT B$
50 PRINT "YOU JUST MADE A COMPOUND
   WORD"
60 PRINT A$;B$
RUN
```

Here is one way to answer the INPUT:

```
GIVE ME TWO WORDS THAT CAN BE JOINED TOGETHER
?FOOT
?BALL
YOU JUST MADE A COMPOUND WORD
FOOTBALL
```

Not just any two words make compound words. But here are some that do: out and side, space and ship, super and market. Run the program a few more times. Try entering these words, as well as some of your own.

Did you know you can have an INPUT using a string and an INPUT using a number in the same program? Here is one. Read it and try to guess what it will do. Then RUN the program to see if you were right.

Type:
```
NEW
10 HOME
20 PRINT "WHAT IS YOUR NAME"
30 INPUT N$
```

```
40 PRINT "I LIKE THE NAME ";N$
50 PRINT "HOW OLD ARE YOU"
60 INPUT A
70 PRINT N$;" YOU ARE ";A;" YEARS OLD"
```

Oh! Oh! Watch your typing. Be sure to leave the spaces inside the quotes on lines 40 and 70. Otherwise your program will print the words all pushed together.

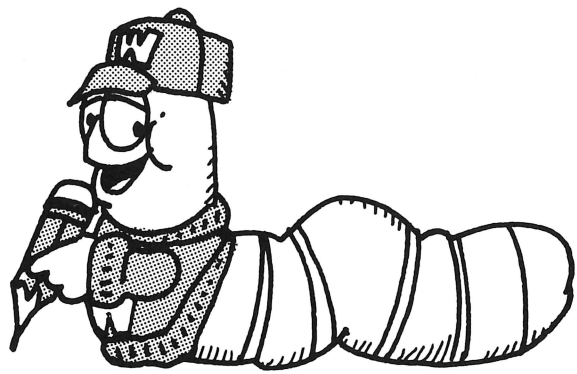
Getting to the Core

- When you want a question answered with letters, use INPUT with strings. Here are some examples: INPUT A$ INPUT B$.
- When you want a question answered with numbers, use INPUT with a letter. Here are some examples: INPUT A INPUT B.

- Remember to type a space inside the quotes when a string is used in a PRINT statement. Here is an example:
  PRINT A$;" IS A NICE NAME"

  SPACE BAR—puts a space between the words.

- Remember to press RETURN after you answer an INPUT in a program.



Paper and Pencil Exercises

Write your answers in the blanks.

1. Finish this program:

```
10 PRINT "WHAT IS YOUR NAME"
20 INPUT _____
30 PRINT "HELLO ";A$
```

2. Finish this program:

```
10 PRINT "PICK TWO NUMBERS TO SUBTRACT"
20 INPUT A,_____
30 PRINT A;" - ";B;" = ";A - B
```

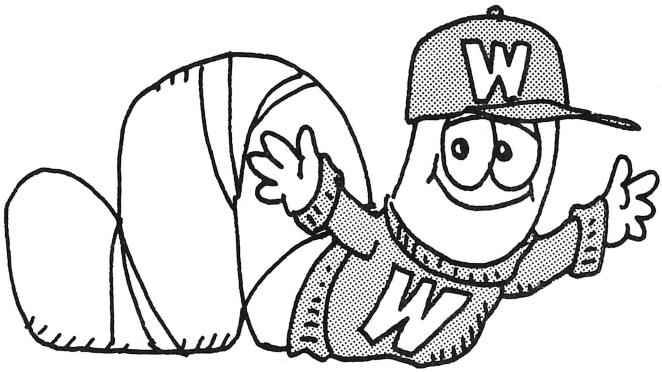
Do you still remember these questions covered in other chapters?

3. To see a program that is in the computer's memory, type

   _____ .

4. To clear the screen, type _____ .

5. To erase a program from memory, type _____ .



Computer Exercises

1. Look at the following RUN. Complete the program for it on page 99. Then type the program into the computer. See if your RUN matches the one here.

```
WHAT'S YOUR NAME
? WOZZY
HI WOZZY LET'S DO SOME MATH
PICK TWO NUMBERS TO ADD
? 4,8
NOW ADD THEM AND TYPE YOUR ANSWER
? 13
YOUR ANSWER IS 13
THE RIGHT ANSWER IS 12
```

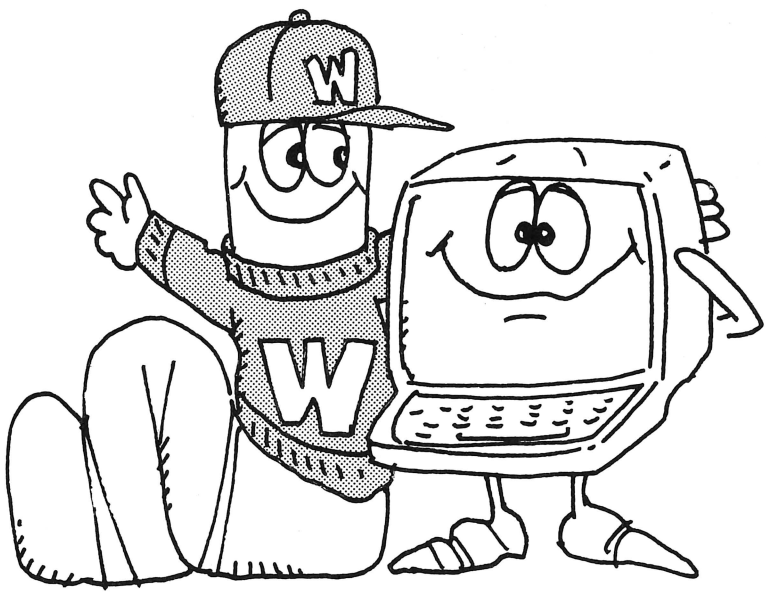
```
10 HOME
20 PRINT "WHAT'S YOUR _____"

30 INPUT _____
40 PRINT "HI ";A$;" LET'S DO SOME MATH"
50 PRINT "PICK TWO NUMBERS TO ADD"

60 INPUT A, _____

70 PRINT "_____ _____ _____ AND
   TYPE YOUR ANSWER"

80 _____ C
90 PRINT "YOUR ANSWER IS ";C
100 PRINT "THE RIGHT ANSWER IS ";A+B
RUN
```



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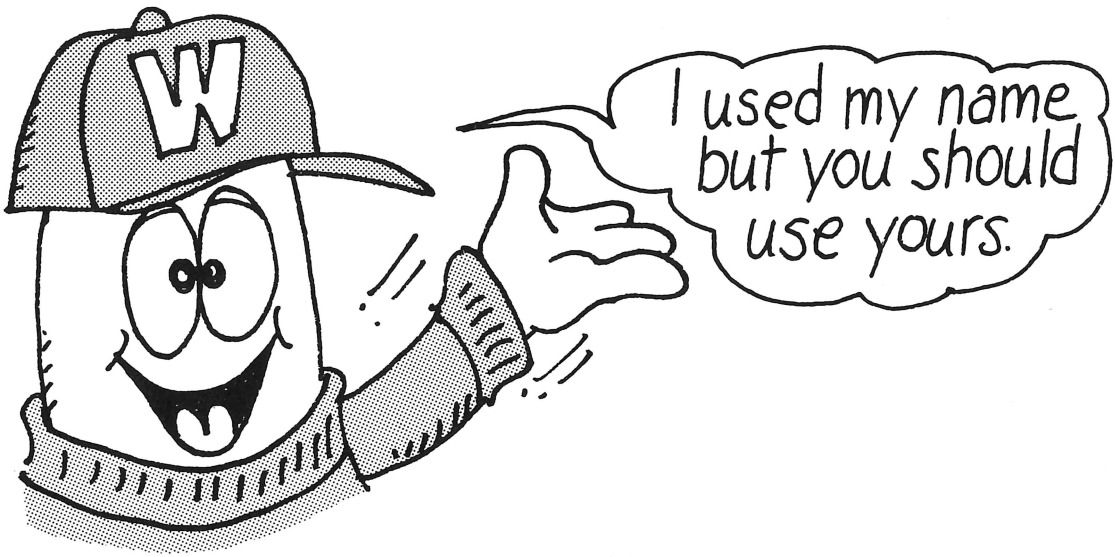
2. Write a program that will give the following RUN.

```
WHAT IS YOUR NAME
? WOZZY
HOW OLD ARE YOU
? 9
9 IS A GREAT AGE WOZZY
```



PROGRAM

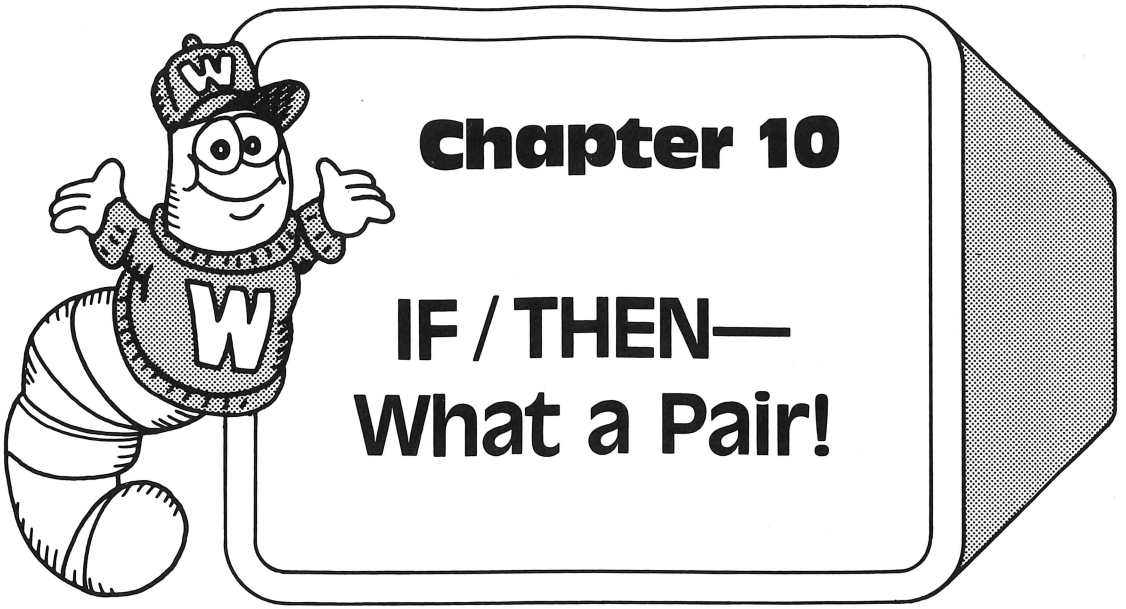
10 _____

20 _____

30 _____

40 _____

50 _____



Chapter 10

IF / THEN— What a Pair!

This girl has a choice to make. Which way will she go? If she chooses path 1, then she will go to school. If she chooses path 2, then she will go to Wozzy's house.

You can have your Apple make the choice. To do this, you use an IF/THEN statement. An IF/THEN statement has two parts. First the computer reads the IF statement. If this part of the program is true, the computer then follows the direction in the THEN part. When the IF part is not true, the computer goes on to the next line.

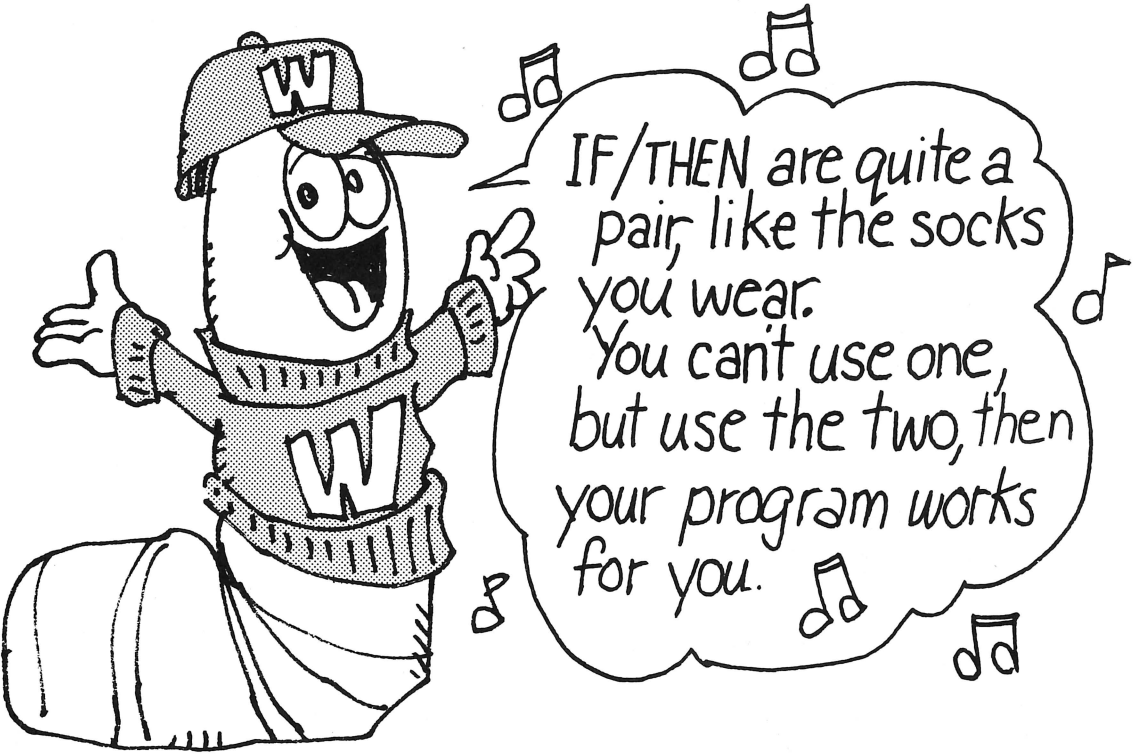
Let's write a program with an IF/THEN statement in it. We will begin our program with a question and an INPUT.

Type:
```
NEW
HOME
10 PRINT "WHICH WAY? TYPE 1 OR 2"
20 INPUT X
```

Remember what INPUT does? When you RUN the program, the Apple will stop at line 20. It will wait for you. A ? will appear and the cursor will blink until you type a 1 or a 2 and press RETURN.

After you type your number, you want the computer to do something. So, you can now add an IF/THEN statement:

```
30 IF X = 1 THEN PRINT "I AM AT SCHOOL."
40 IF X = 2 THEN PRINT "I AM AT WOZZY'S
   HOUSE."
```



Look at lines 30 and 40 carefully. Typing a 1 will make X = 1. Next the Apple will print I AM AT SCHOOL. Typing 2 will make X = 2. What will the Apple print then? See if you are right. Here is the whole program. Type it in and RUN it. When you see the ? type a 2.

Type:
```
NEW
HOME
10 PRINT "WHICH WAY? TYPE 1 OR 2"
20 INPUT X
30 IF X = 1 THEN PRINT "I AM AT HOME."
40 IF X = 2 THEN PRINT "I AM AT WOZZY'S
   HOUSE."
RUN
```

Sure enough! When you typed in 2, the computer took the path to Wozzy's house!

Suppose you want to add another choice (X = 3). It is very easy to do. First LIST the program. Change line 10.

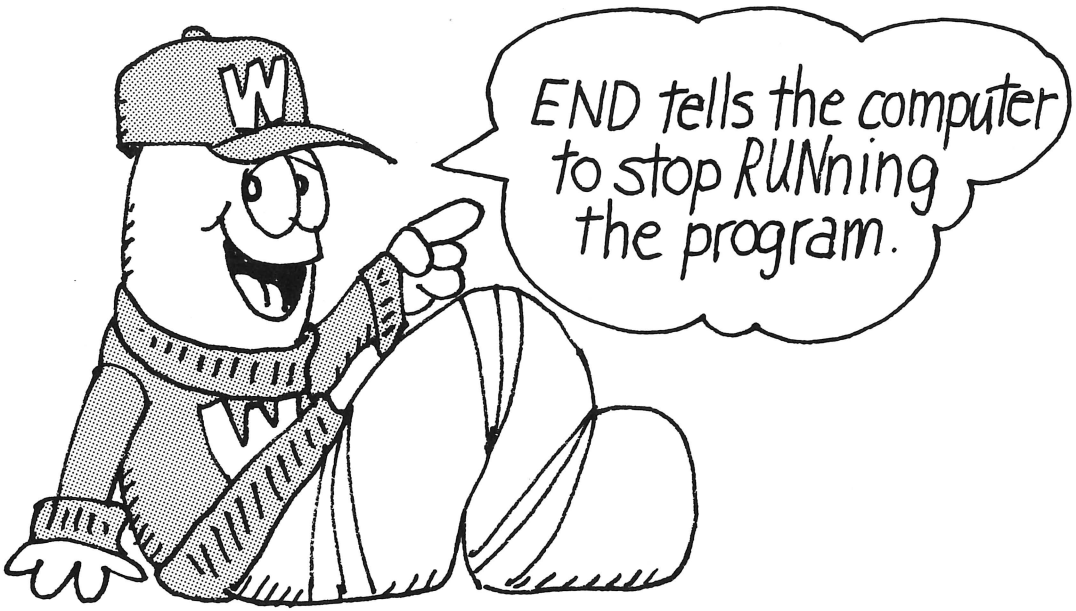
Type: LIST
Type: 10 PRINT "WHICH WAY? TYPE 1 OR 2 OR 3"

Next add an IF/THEN statement at line 50.

Type: 50 IF X = 3 THEN PRINT "I AM BACK HOME."

Now when you type in a 3, the computer will print I AM BACK HOME. So far, you have only made a letter equal a number (for example: X = 1 or X = 2 or X = 3).

Here are some examples. (Notice that in these examples there are no PRINT statements after THEN. Instead, an END command comes after THEN.)

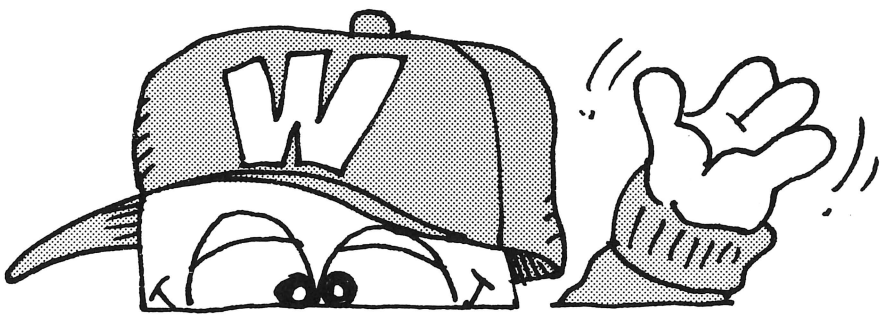


IF X>3 THEN END ends the program only IF X is greater than 3.

IF X<3 THEN END ends the program only IF X is less than 3.

IF X<>3 THEN END ends the program only IF X is not equal to 3.

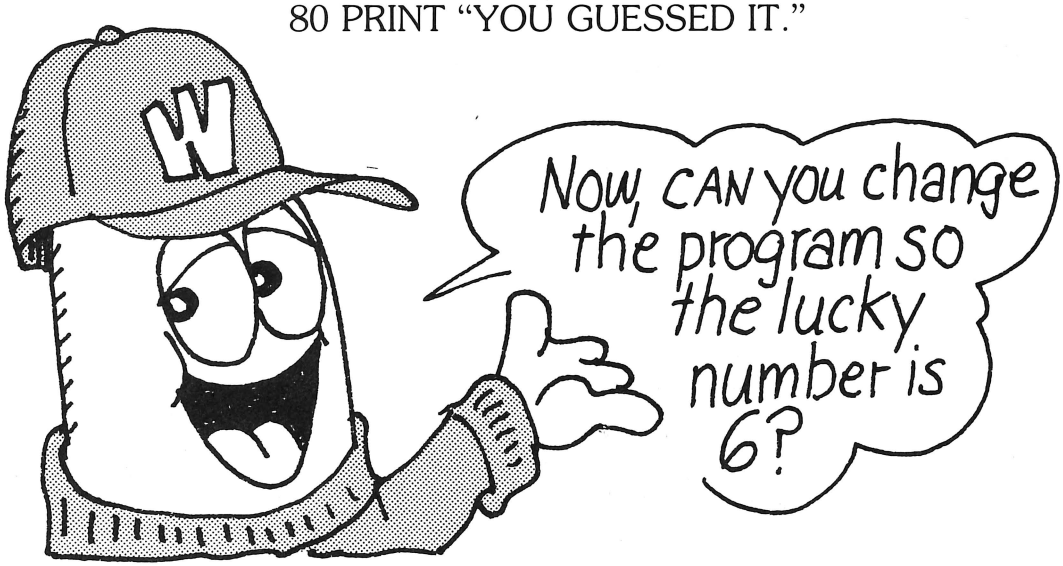
You can also have GOTO after THEN in an IF/THEN statement.



Here is an example: IF X< >10 THEN GOTO 20. This statement will make the computer go to line 20 only if X does not equal 10.

Here is a program that uses GOTO, >, <, and < >. Try to guess what it will do before you RUN it.

Type:
```
NEW
HOME
10 PRINT "PICK THE LUCKY NUMBER. IT IS
   BETWEEN 1 AND 10."
20 INPUT A
30 IF A<4 THEN PRINT "THAT WAS TOO
   LOW."
40 IF A>4 THEN PRINT "THAT WAS TOO
   HIGH."
50 IF A=4 THEN GOTO 80
60 PRINT "SORRY THE LUCKY NUMBER
   WAS 4."
70 END
80 PRINT "YOU GUESSED IT."
```



Hint: To do this, you must make changes in lines 30, 40, 50, and 60.

Getting to the Core

- IF/THEN lets the computer make a decision.
- If the first part of the statement is true, then the computer goes to the second part.
- If the first part of the statement is NOT true, the computer simply goes on to the next line in the program.
- = means equal to.
- < means less than.
- > means greater than.
- <> means not equal to.

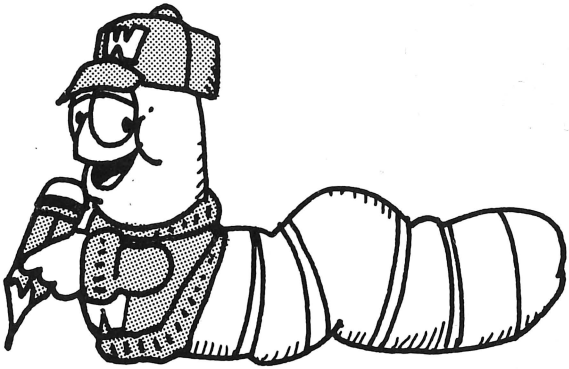
Here is a program with three examples of IF/THEN:

```
Type:
10 PRINT "HOW OLD ARE YOU"
20 INPUT A
30 IF A=10 THEN PRINT "WHAT A GREAT AGE"
40 IF A<10 THEN PRINT "YOU ARE YOUNG"
50 IF A>10 THEN PRINT "YOU ARE OLD"
```

This program will write only one statement after you type in your age. If you type in 10, then it will print WHAT A GREAT AGE.

If you type in 9 or any number less than 9, the program will print YOU ARE YOUNG.

If you type 11 or any number greater than 11, the program will print YOU ARE OLD.



Paper and Pencil Exercises

Write the answers in the blanks.

1. The symbol _____ means less than.
2. The symbol _____ means greater than.
3. The symbol _____ means not equal to.
4. Suppose you write this in a program: IF B = 6 THEN PRINT "I LOVE YOU." The computer will print I LOVE YOU only if

   _____ .
5. If you want the computer to go to line 20 only when A = 2 you type: IF A = 2 _____ GOTO 20.

Computer Exercises

1. Complete the following program so that you get RUNs like those shown on page 109. (You must RUN the program three times and INPUT a different answer each time.)

   10 PRINT "HOW MANY _____ _____

   _____ _____ "

   20 INPUT A

   30 IF _____ < 4 _____ PRINT "THAT'S A SMALL FAMILY."

```
40 IF _____ =4 THEN PRINT "THAT'S _____
   _____ _____ "
50 IF A>4 _____ _____ "THAT'S A BIG
   FAMILY."
RUN
```

Here are the program's RUNs.

```
HOW MANY PEOPLE IN YOUR FAMILY
?(Type 5)
THAT'S A BIG FAMILY

HOW MANY PEOPLE IN YOUR FAMILY
?(Type 4)
THAT'S A NICE NUMBER

HOW MANY PEOPLE IN YOUR FAMILY
?(Type 2)
THAT'S A SMALL FAMILY
```

2. Complete each of the two RUNs for the following program. Then type the program into your computer and RUN it two times. See if your answers agree with the RUNs on your computer.

```
10 HOME
20 PRINT "HOW MANY FRIENDS DO YOU HAVE"
30 INPUT A
40 IF A<5 THEN GOTO 60
50 PRINT A;" FRIENDS ARE A LOT":END
60 PRINT A;" FRIENDS ARE NOT VERY MANY"
RUN
```

Look at line 50. The colon (:) means it is the end of a statement. You can write another statement after the colon. In this line we wrote END.

a.

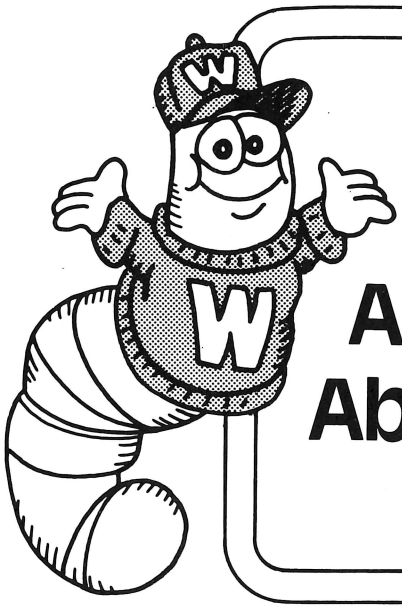
HOW MANY _____
? (Type 6)

_____

b.

HOW MANY _____
? (Type 4)

_____



CHAPTER 11

A Little More About IF / THEN

In Chapter 10, we used only numbers with IF/THEN. But you can use strings, too.

Watch!

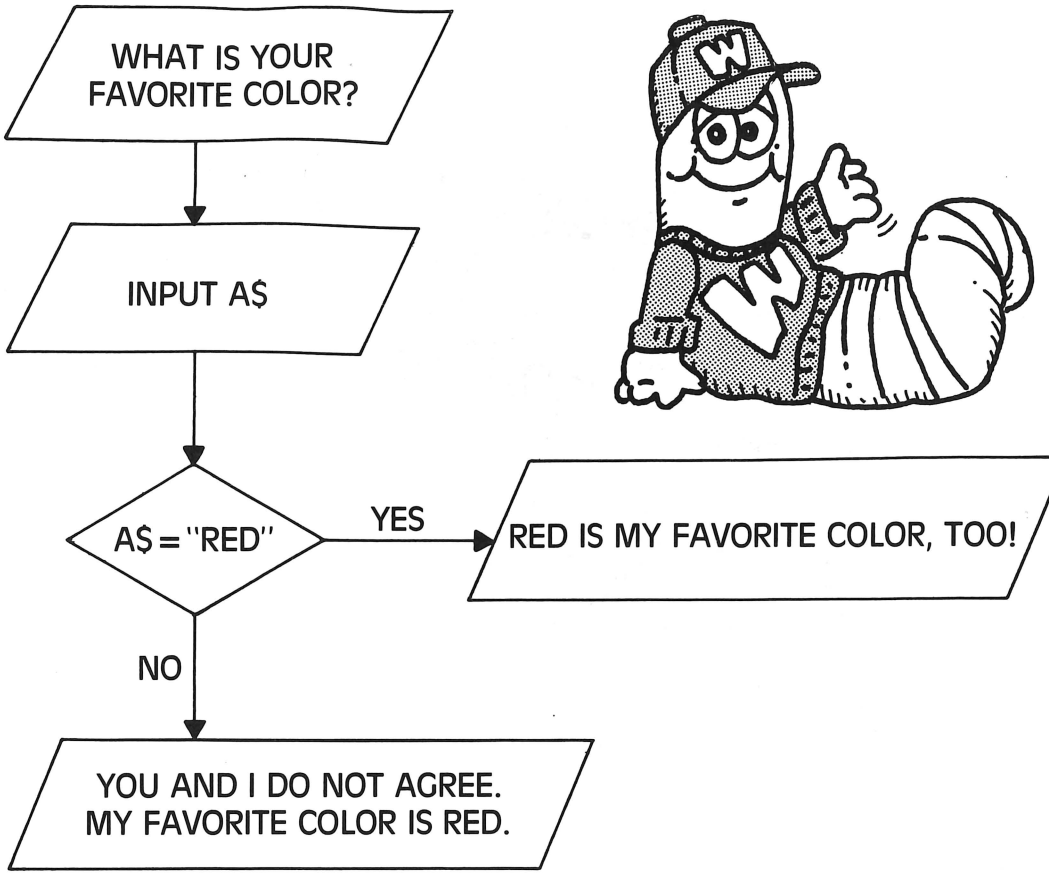
Type:
```
NEW
HOME
10 PRINT "WHAT IS YOUR FAVORITE
   COLOR?"
20 INPUT A$
30 IF A$="RED" THEN PRINT "RED IS MY
   FAVORITE COLOR, TOO!":END
40 PRINT "YOU AND I DO NOT AGREE. MY
   FAVORITE COLOR IS RED."
```

Before you RUN the program, look at line 30. See how RED is inside " "?

Now let's see how this program works. Type RUN. RUN the program two times. For the first RUN, type BLUE when you see the ?. The second time type RED. Here is what you should see on your screen.

```
WHAT IS YOUR FAVORITE COLOR?
?BLUE
YOU AND I DO NOT AGREE. MY FAVORITE COLOR IS RED.

RUN
WHAT IS YOUR FAVORITE COLOR?
?RED
RED IS MY FAVORITE COLOR, TOO!
```

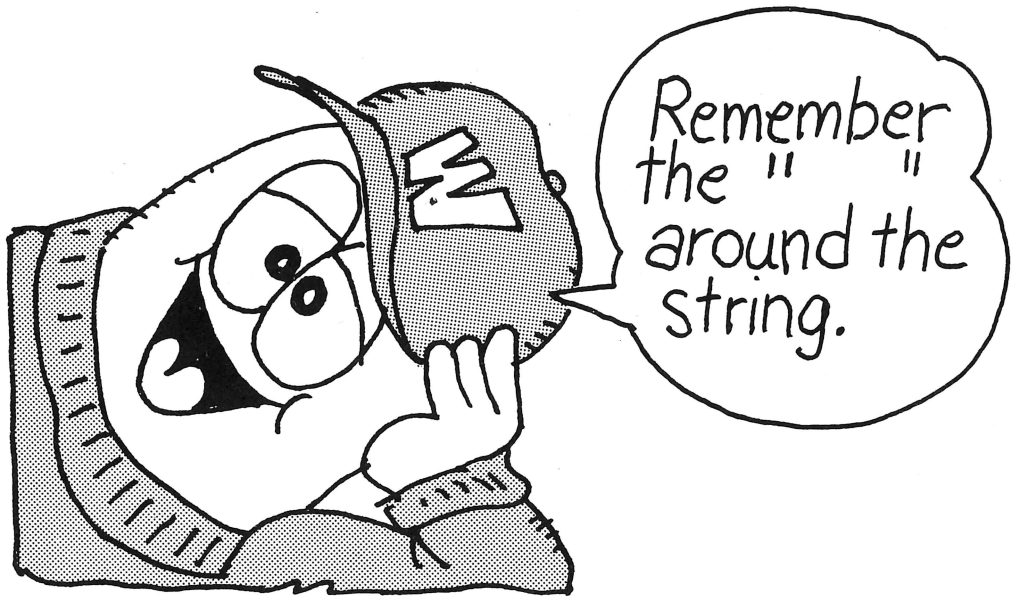
Each time you run the program, the computer checked to see if your answer matched the string RED. The following flowchart shows how the computer followed the program.



To really understand IF/THEN statements, you must practice using them in programs. Wozzy has two more programs for you. As you can see, the < > can be used with strings, too. < > means not equal to, just as it does with numbers.

PROGRAM 1

```
NEW
10 HOME
20 PRINT "WHAT IS YOUR NAME"
30 INPUT N$
40 IF N$< >"WOZZY" THEN GOTO 60
50 PRINT "YOU CAN'T BE WOZZY. I'M WOZZY !":
   END
60 PRINT "HI!   ";N$;"   MY NAME IS WOZZY."
```



Notice that in this program the computer will go to line 60 only if N$ < > "WOZZY".

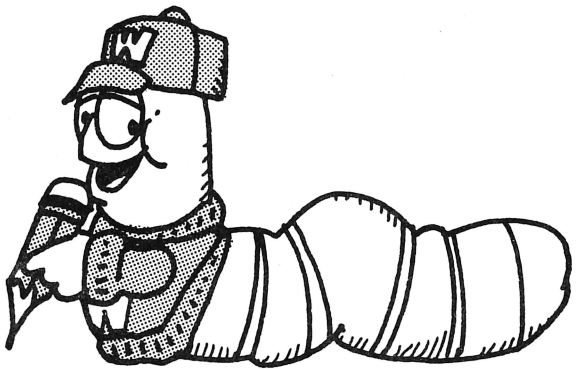
The next program uses IF/THEN with both numbers and strings.

PROGRAM 2

```
NEW
10 HOME
20 PRINT "WHAT ICE CREAM FLAVOR DO YOU
   THINK I LIKE BEST"
30 INPUT A$
40 IF A$="CHOCOLATE" THEN GOTO 60
50 PRINT "SORRY, THAT'S NOT IT.
   GOODBYE.":END
60 PRINT "UMMMMM, THAT'S IT!"
70 PRINT "WHAT IS YOUR LUCKY NUMBER"
80 INPUT N
90 IF N=4 THEN PRINT "THAT'S MINE, TOO!":END
100 PRINT N;" IS NOT A VERY LUCKY NUMBER
   FOR ME."
```

Getting to the Core

- You can put strings into IF/THEN statements.
- You can use the signs = and < > with strings in IF/THEN statements.
- A colon allows you to put more than one command on a line.
- END tells the computer to stop the program.



Paper and Pencil Exercises

Fill in the blanks or circle the right answer.

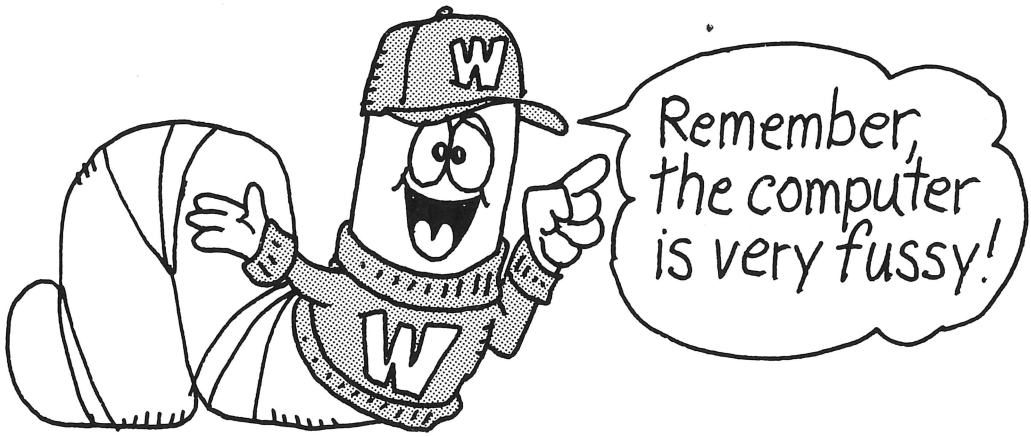
1. A line in a program reads:
   IF X$ = "HAMBURGER" THEN END
   What will the computer do if the string X$ is HAMBURGER?

   _____

2. Circle the sign that will let you add a command or statement to a line. < > < > :

3. Which of the following statements is typed correctly? Circle your answer.

   A. IF Z$ = HAROLD THEN PRINT "KISS ME"
   B. IF Z$ = "HAROLD THEN PRINT "KISS ME"
   C. IF Z$ = "HAROLD" THEN PRINT "KISS ME"



4. Here is a program with line 40 missing. What should line number 40 say to get the RUN that is shown on the screen after the program?

```
NEW
10 PRINT "CAN YOU GUESS MY BEST SUBJECT?"
20 PRINT "IT BEGINS WITH AN M"
30 INPUT G$

40 _____
50 PRINT "SORRY, BUT IT IS NOT MATH."
RUN
```

```
CAN YOU GUESS MY BEST SUBJECT?
IT BEGINS WITH AN M
?MUSIC
MUSIC IS CORRECT.
```

Computer Exercises

1. Complete the following program so it will RUN like those on the screens below.

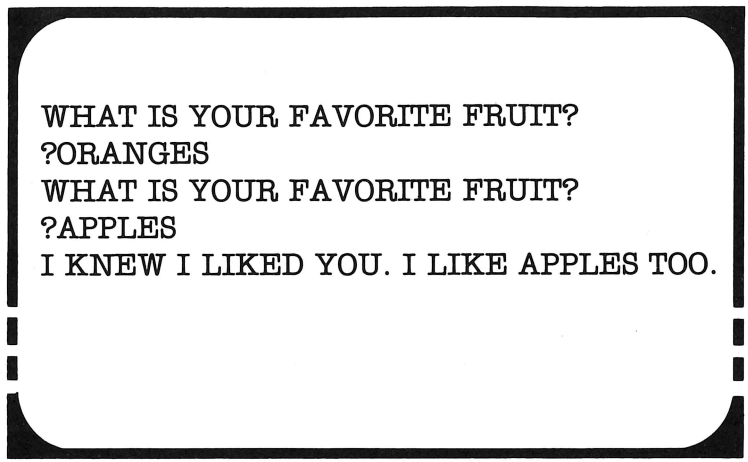
```
NEW
10 PRINT "GUESS _____"
20 PRINT "GUESS YELLOW OR _____"
30 _____
40 IF A$="_____" THEN PRINT
   "_____" :END
50 IF _____="YELLOW" _____ PRINT
   "_____"
RUN
```

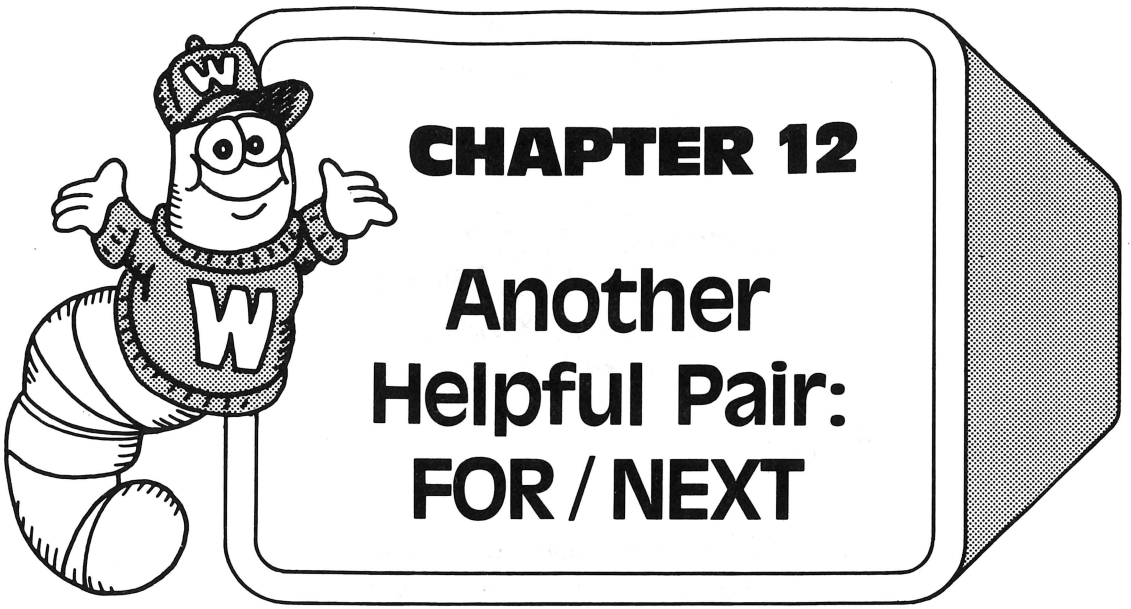
```
GUESS THE COLOR OF WOZZY'S BICYCLE.
GUESS YELLOW OR RED.
?RED
RIGHT, WOZZY LOVES RED.
```

```
RUN
GUESS THE COLOR OF WOZZY'S BICYCLE.
GUESS YELLOW OR RED.
?YELLOW
NO. THAT COLOR IS FOR MONKEYS.
```

2. Read the following program and its RUN. There are two mistakes in the program. Find the mistakes. Type the corrected program into your computer and RUN it.

```
NEW
10 HOME
20 PRINT "WHAT IS YOUR FAVORITE FRUIT?"
30 INPUT A
40 IF A$="APPLES" THEN GOTO 20
50 PRINT "I KNEW I LIKED YOU. I LIKE APPLES
   TOO."
RUN
```





CHAPTER 12

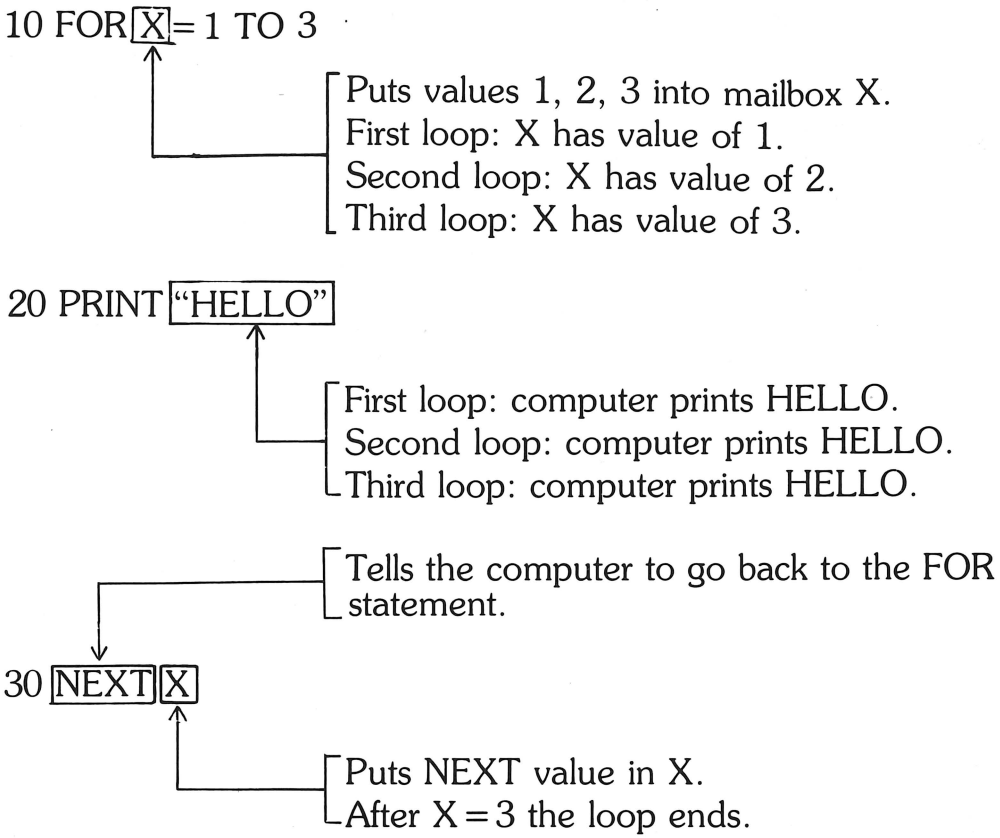
Another Helpful Pair: FOR / NEXT

Remember using GOTO in a program? You made the program RUN over and over. GOTO puts a loop in your program like this one.

```
10 PRINT "HELLO"
20 GOTO 10
```

This program writes HELLO all the way down the screen.

But suppose you only want to write HELLO three times. There is an easy way to do this. It is with two BASIC words: FOR and NEXT. Here is how they work in a program. Notice that they make a loop, too.

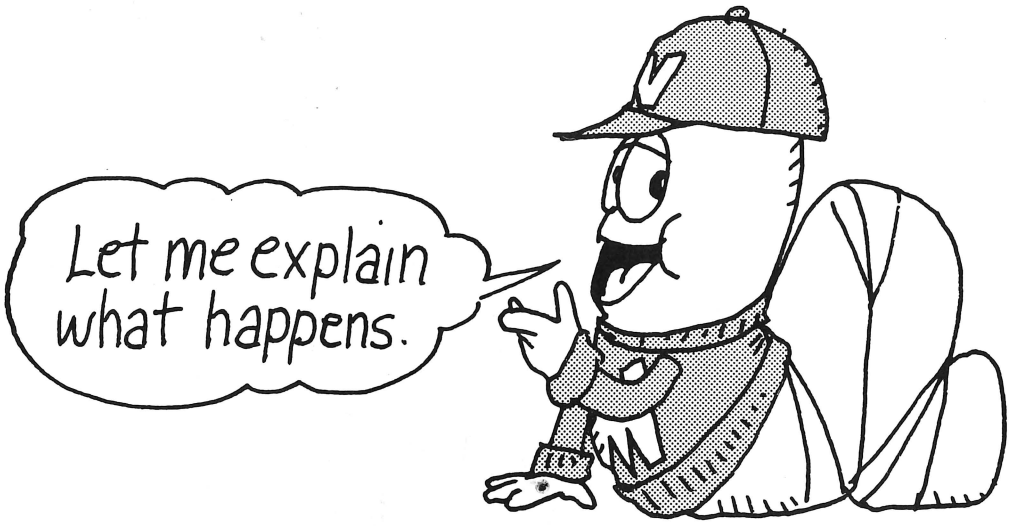

10 FOR X = 1 TO 3
Puts values 1, 2, 3 into mailbox X.
First loop: X has value of 1.
Second loop: X has value of 2.
Third loop: X has value of 3.
20 PRINT "HELLO"
First loop: computer prints HELLO.
Second loop: computer prints HELLO.
Third loop: computer prints HELLO.
Tells the computer to go back to the FOR statement.
30 NEXT X
Puts NEXT value in X.
After X = 3 the loop ends.

What do you think will happen with this program?

```
10 FOR X = 1 TO 5
20 PRINT "HELLO"
30 NEXT X
```

If you said HELLO will be printed five times, you are right.

Notice the FOR and the NEXT. These statements allow you to be in command of the number of times you would like the computer to do something without stopping.



This tells how many times the program is to loop.

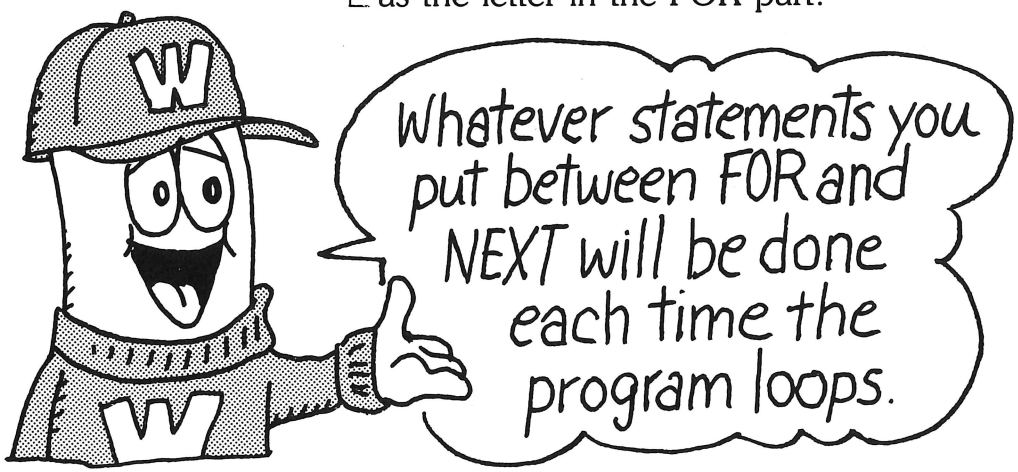
```
10 FOR X = 1 TO 5
```

Use any letter.

This makes the program go back to the FOR statement.

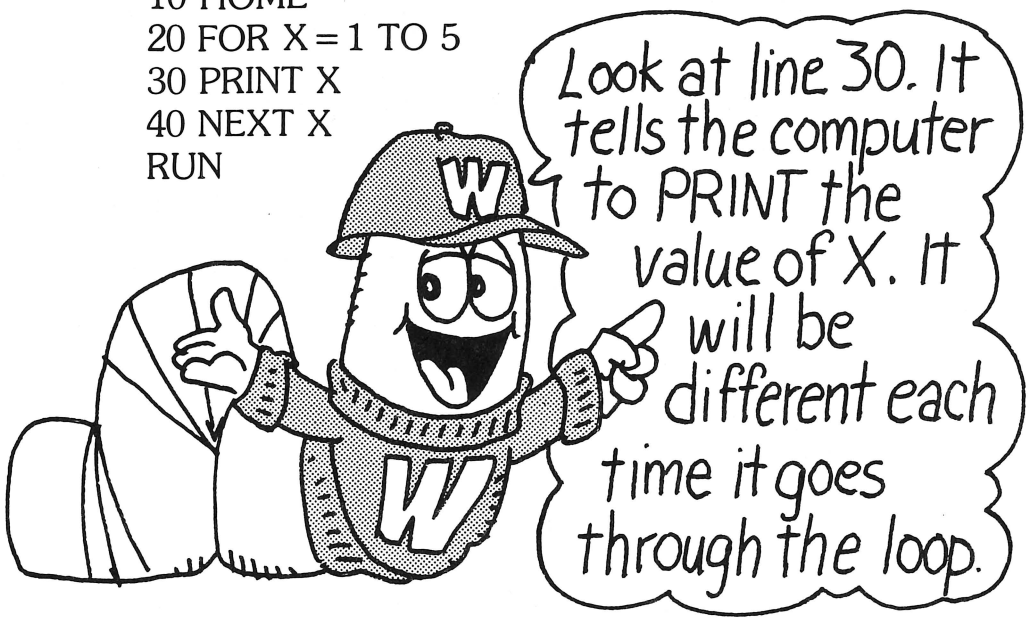
```
20 NEXT X
```

This letter must always be the same as the letter in the FOR part.



Here is a program that lets you count the loops. Type it in and see what happens.

```
NEW
10 HOME
20 FOR X = 1 TO 5
30 PRINT X
40 NEXT X
RUN
```



Did you see how X changed each time? Try changing line 20. Make the program count to 10. LIST the program and make the needed changes. RUN the program. See how you can command the computer to do just what you want? Now make it count to 25.

In the next program, you will see what happens after the FOR/NEXT loop is finished.

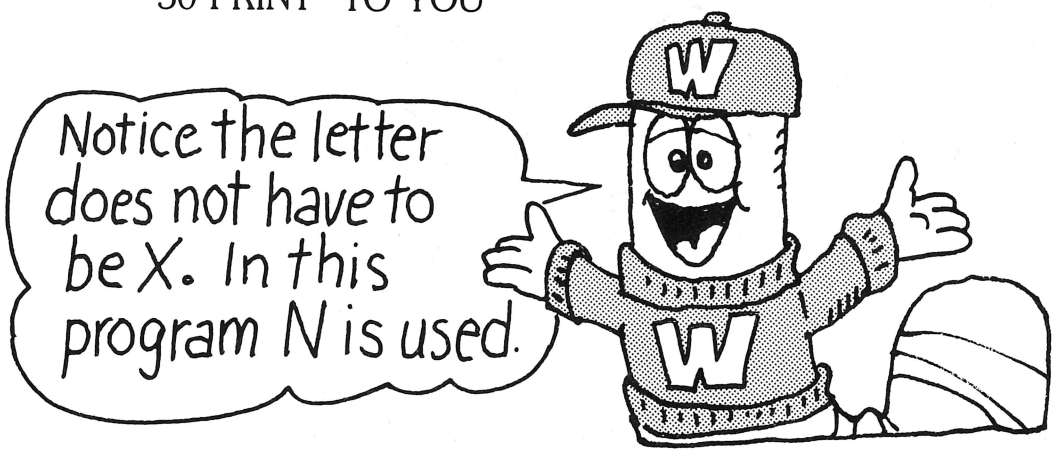
Type:

```
NEW
10 HOME
20 FOR X = 1 TO 5
30 PRINT "I'M IN LOOP NUMBER ";X
40 NEXT X
50 PRINT "I'M NOT IN THE LOOP
   ANYMORE. I'M DONE."
RUN
```

Did you see what happened after X reached 5? The program went on to the line after NEXT X. That was line 50 in the program.

Here is a fun program. Read it first. See if you can guess what will happen. Type the program, RUN it, and see if you were right.

```
NEW
10 HOME
20 FOR N=1 TO 3
30 PRINT "HAPPY BIRTHDAY"
40 NEXT N
50 PRINT "TO YOU"
```



Before going on, try changing this program so that it says HAPPY BIRTHDAY five times.

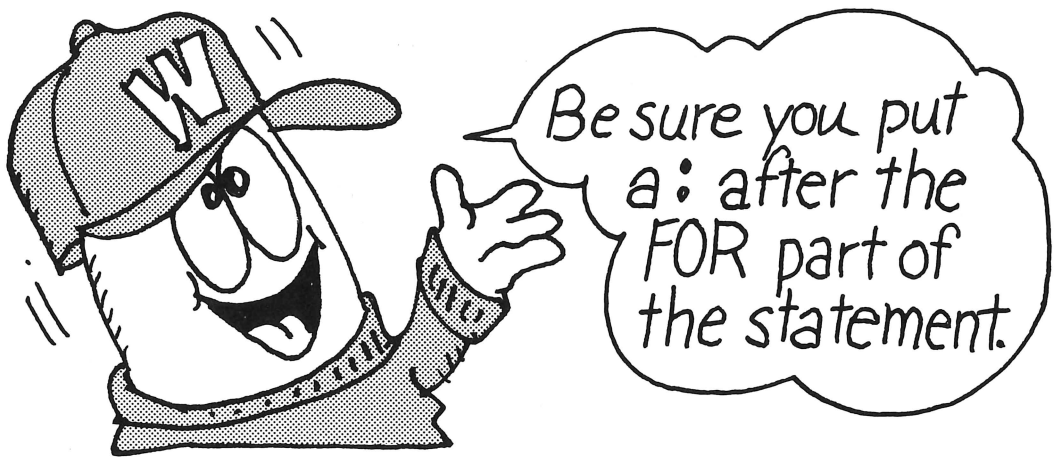
Good! Now write a program that will print your name 10 times on the screen.

Something Extra for the Expert

You can use a FOR/NEXT loop with no statements in between. When you do this, it is called a "time delay." The computer just counts from one to whatever number you tell it. Your computer will then go to the next line in the program.

Here is a program with a time delay.

Type:
```
NEW
10 HOME
20 PRINT "I WILL FINISH THIS PROGRAM
   VERY SOON. JUST WAIT."
30 FOR X=1 TO 1000:NEXT X
40 PRINT "THERE, NOW I'M FINISHED."
RUN
```



After running the program, change the 1000 in line 30 to a different number. RUN the program after each change to see what happens.

Getting to the Core

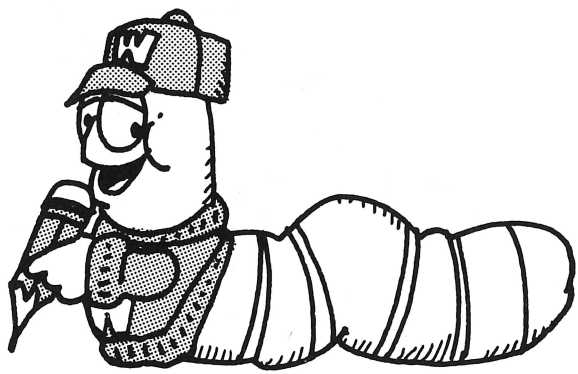
- A FOR/NEXT statement puts a loop in your program.

- FOR/NEXT loops make the computer do something as many times as you say.
- Write what you want the computer to do between the FOR part and the NEXT part of the statement. For example, if you want the computer to print GOODBYE five times, type:

```
10 FOR X=1 TO 5
20 PRINT "GOODBYE"
30 NEXT X
```

- The letter in the FOR part must always be the same as the letter in the NEXT part.
- Use FOR/NEXT as a time delay by writing a statement such as

```
FOR N=1 TO 1000:NEXT N
```



Paper and Pencil Exercises

Write the answers in the blanks.

1. To make the computer do something more than once, you can use GOTO or a _____ loop.
2. Fill in the blank in this program:

```
10 FOR C=1 TO 3
20 PRINT "I LOVE MY COMPUTER."

30 NEXT _____
```

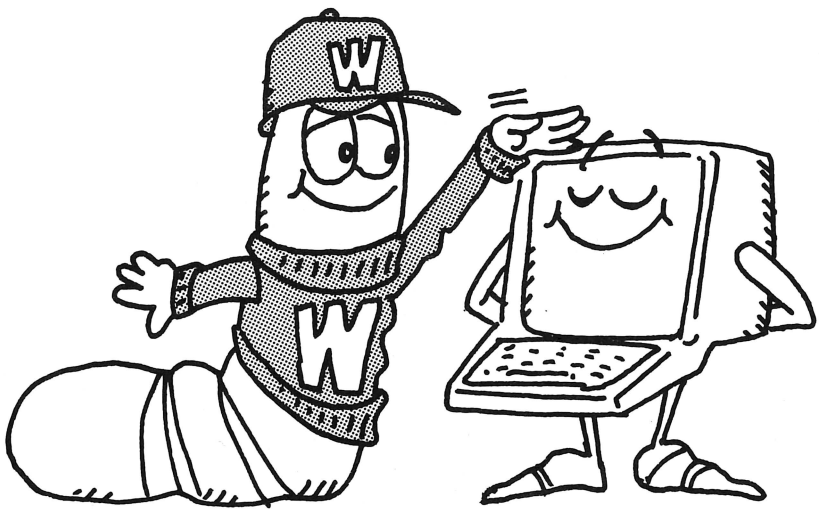
3. Read the following program:

```
10 FOR X=1 TO 5
20 PRINT "I AM AN APPLE"
30 NEXT X
```

This program will print I AM AN APPLE _____ times.

4. To use FOR/NEXT as a time delay, you can type:

FOR X=1 TO 500 _____ NEXT X

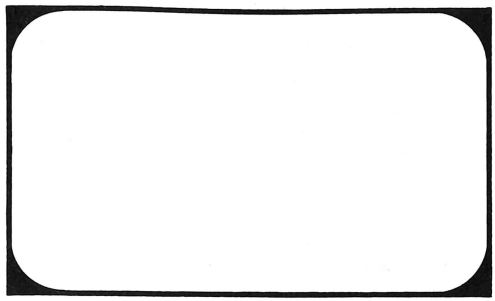


Computer Exercises

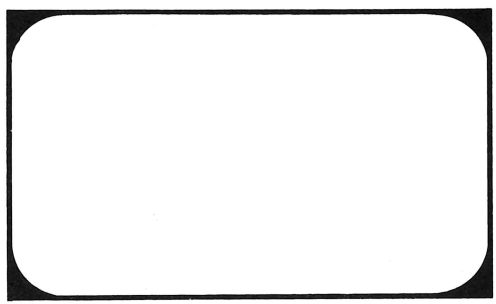
Read the following programs. Then write on each screen what will appear when you RUN the programs.

After you have written your answers, type in the first program. RUN it and see if you were right. Then do the same thing with the second program.

```
NEW
10 HOME
20 PRINT "WHAT IS YOUR NAME"
30 INPUT A$
40 FOR X=1 TO 5
50 PRINT "HELLO "; A$
60 NEXT X
```

1. 

```
NEW
10 HOME
20 FOR T=1 TO 10
30 PRINT T
40 NEXT T
50 PRINT "THAT'S ALL FOLKS"
```

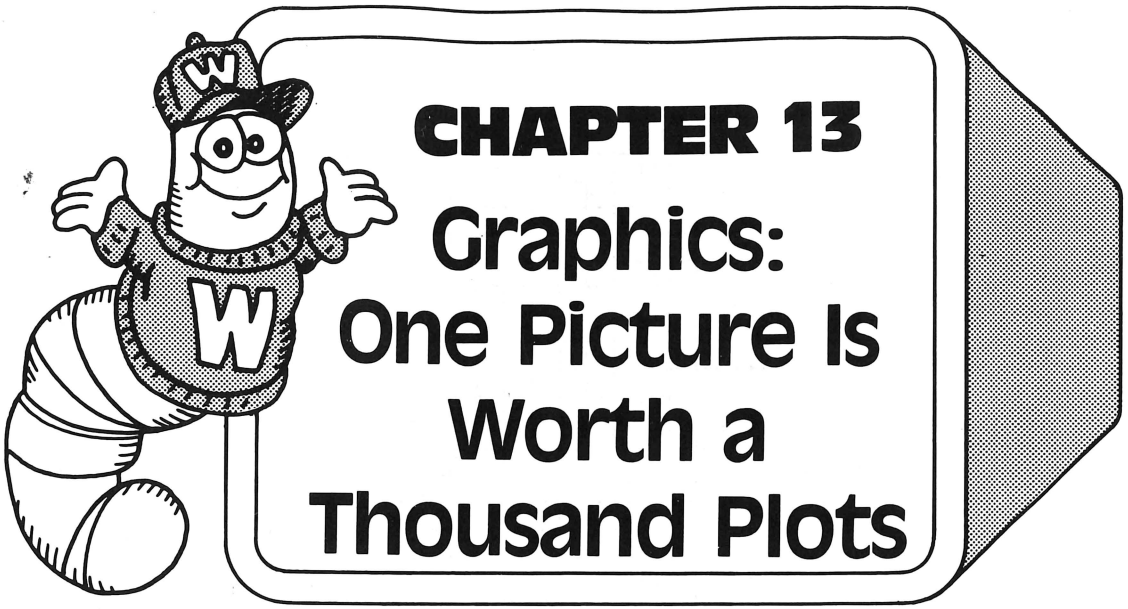
2. 

3. Here is an incomplete program. Following it is a RUN. Complete the program. RUN the program and check it against the RUN here to see if your completed program is correct.

```
NEW
10 HOME

20 FOR X = 1 TO _____

30 PRINT "WHAT'S _____ _____?"

40 INPUT _____
50 PRINT "HI   ";A$". MY NAME IS APPLE."

60 _____ _____
```

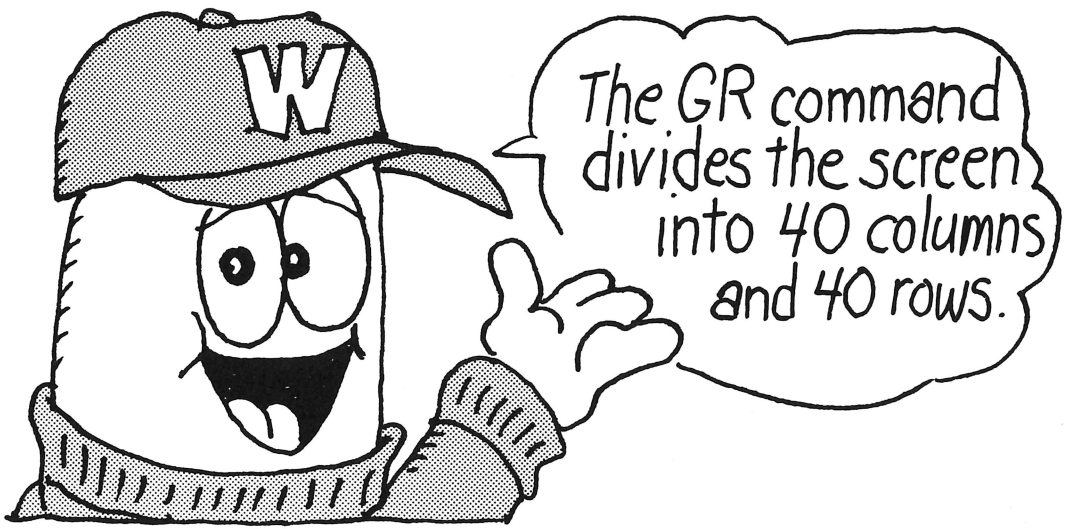
```
WHAT'S YOUR NAME?
?WOZZY (You can type your name.)
HI WOZZY. MY NAME IS APPLE.
WHAT'S YOUR NAME?
?CPU (You can use another name.)
HI CPU. MY NAME IS APPLE.
```

Notice that the program RUNs two times then stops.

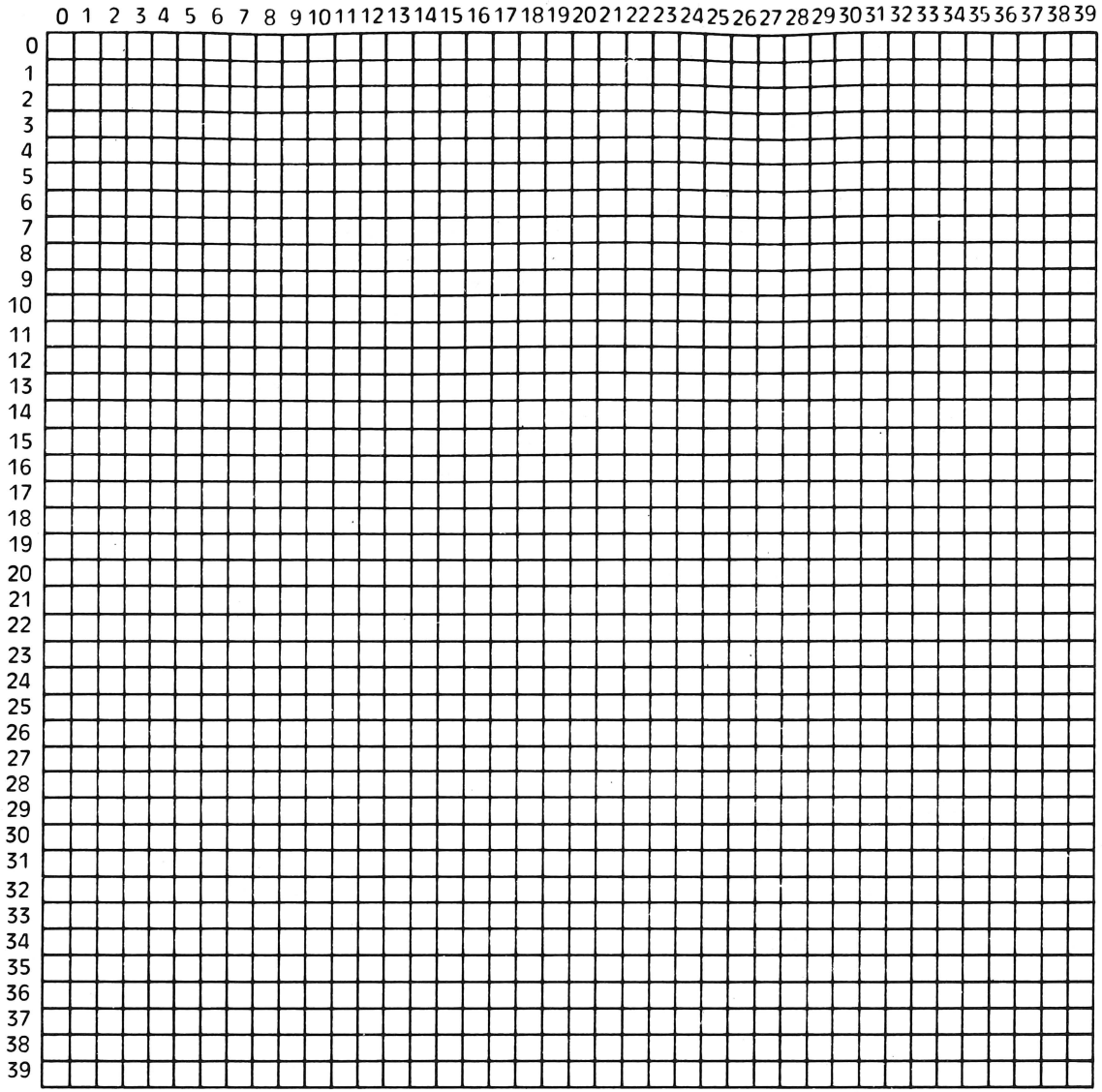


CHAPTER 13
Graphics: One Picture Is Worth a Thousand Plots

So far your programs have been in the TEXT mode. But to draw pictures and shapes with the Apple, you must be in GRAPHICS mode. To change to the GRAPHICS mode, you type GR as a line in your program.

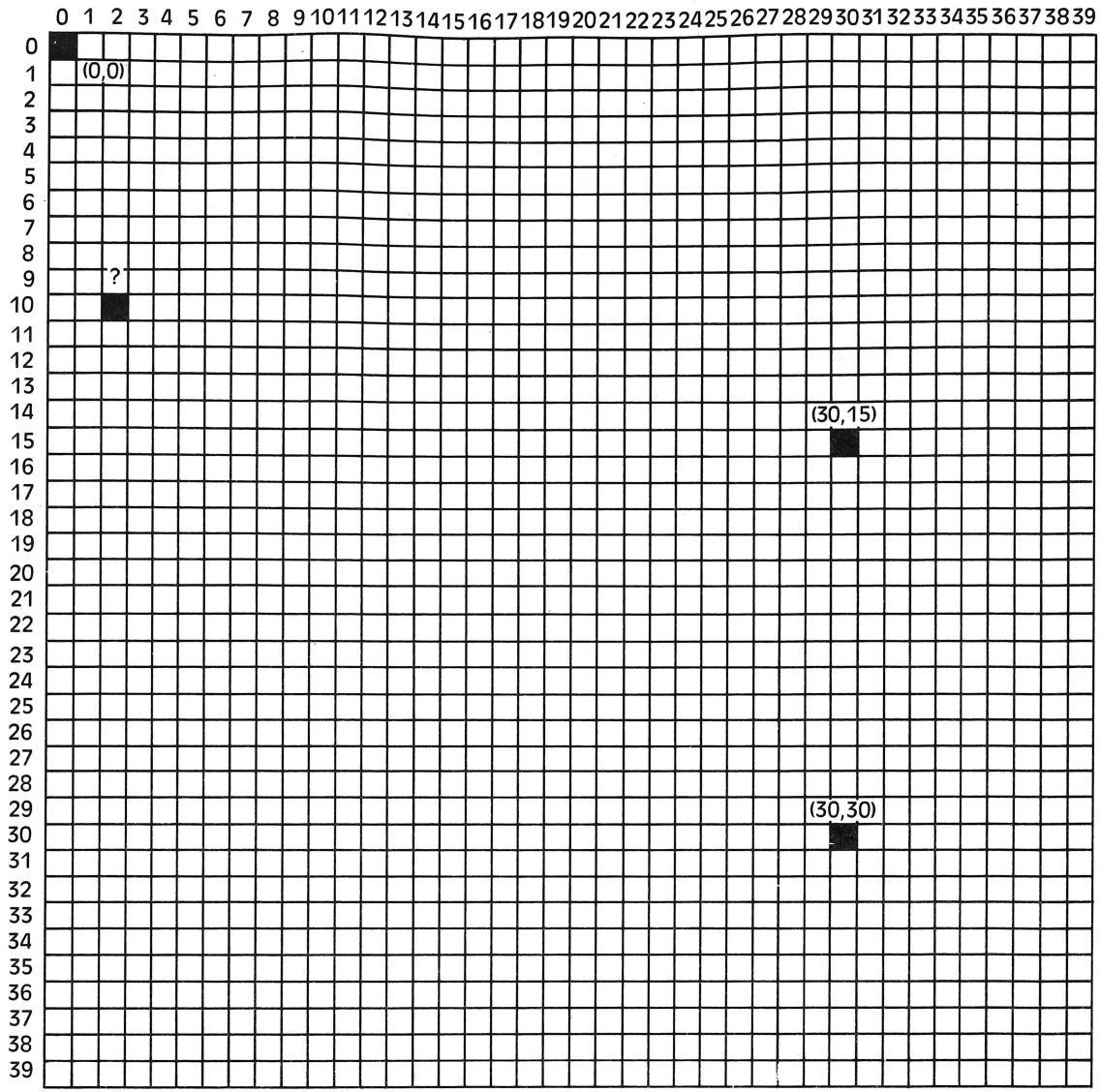


The columns and rows make little squares on the screen. You can't see the columns and rows. But if you could, they would look like this.



Each of the squares on the screen has a name. Its name is the number of the column (on the top) and the number of the row (on the side). A comma is placed between the two numbers when you write your program.

Here are some examples.



Can you name the square with the ? above it? Count the squares across first, then down. If you answered 3,10 you are right.

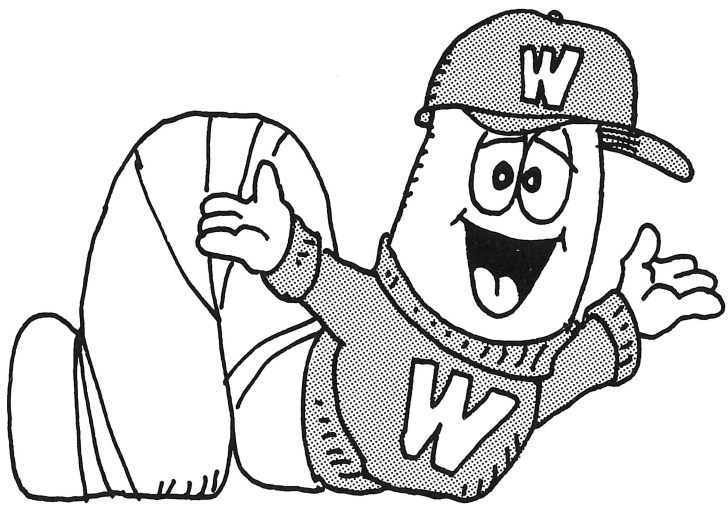
These squares are very important. You draw by lighting up different squares on the screen.

But to do this you MUST:

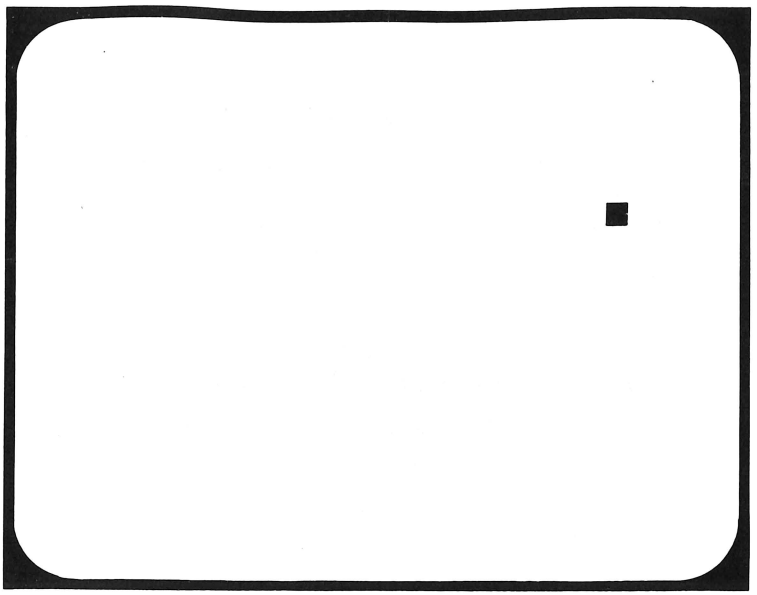
1. Be in GRAPHICS mode (GR).
2. Name a COLOR for the square. (Do this even if you are using a monitor that does not have color. If you don't, the computer will use COLOR 0, which is black, and you won't see anything.
3. Put the square on the screen by naming it in a PLOT statement.

Here is a program that does all these things. Read it first, then type it in.

```
NEW
10 GR
20 COLOR=8
30 PLOT 32,15
RUN
```



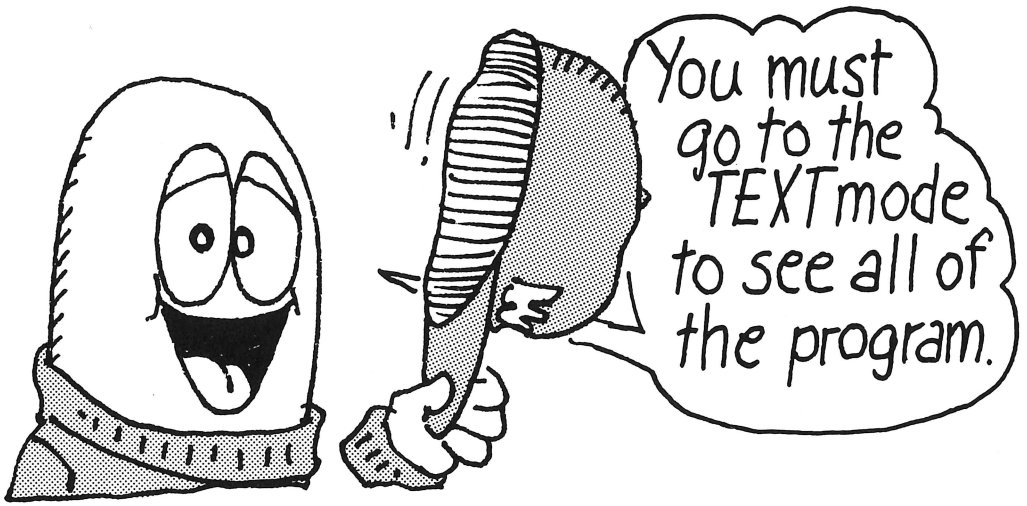
When you RUN this program, your screen should look like this:



Now let's look at the program again.

Type: LIST

Woops! That doesn't seem to work. You can't see all of the program. It rolled to the bottom of the screen.



Type: TEXT
HOME

LIST

Let's put some more squares on the screen. You use PLOT statements to do this. Add these statements to your program.

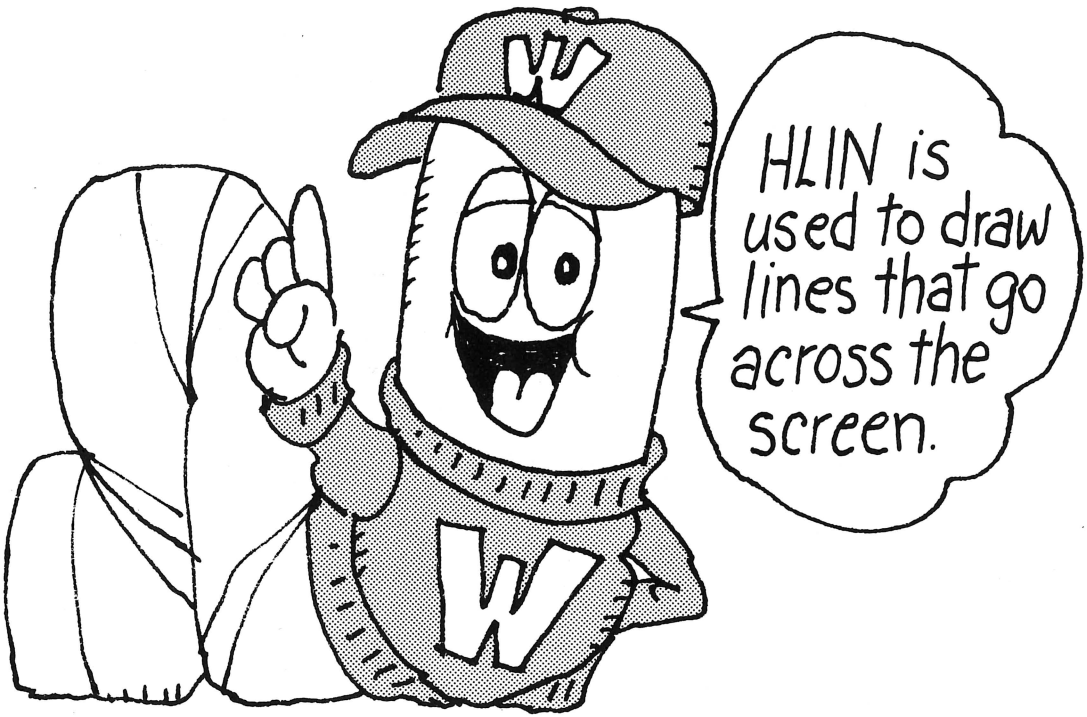
```
40 PLOT 12,14
50 PLOT 1,1
RUN
```

Work with this program for a while. Change the PLOT numbers or add some more PLOT statements. See if you can put a square just where you want it on the screen.

Remember, type TEXT and then HOME when you want to LIST the program. If you have a color monitor, you may want to change colors of the squares. You have 16 colors to choose from. Here is a list.

COLOR 0 = Black
COLOR 1 = Magenta
COLOR 2 = Dark blue
COLOR 3 = Purple
COLOR 4 = Dark green
COLOR 5 = Gray
COLOR 6 = Medium blue
COLOR 7 = Light blue
COLOR 8 = Brown
COLOR 9 = Orange
COLOR 10 = Gray not quite like 5
COLOR 11 = Pink
COLOR 12 = Green
COLOR 13 = Yellow
COLOR 14 = Aqua
COLOR 15 = White

Here are two other GRAPHICS statements that are fun. One is HLIN.



Type this program to see HLIN in action.

```
NEW
10 GR
20 COLOR=8
30 HLIN 10,20 AT 15
RUN
```

HLIN 10,20 AT 15 means draw a line from the column 10 to column 20 at row 15.

Now try changing the numbers in the HLIN part of the program. Remember, you cannot use any number greater than 39.

The other GRAPHICS command is VLIN. This will make lines going up and down the screen.

Try this program to see VLIN in action.

```
NEW
HOME
10 GR
20 COLOR=5
30 VLIN 15,25 AT 10
RUN
```

VLIN 15,25 AT 10 means draw a line from row 15 to row 25 at column 10.

Now try changing the numbers in the VLIN part of the program.

Here are a couple of important things to remember:

1. Do not use numbers greater than 39.
2. Type TEXT, HOME, and then LIST to see your program.

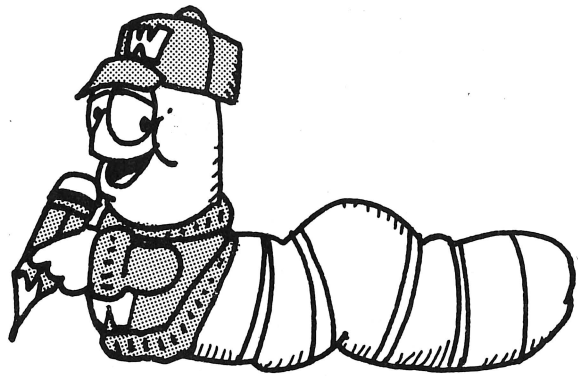
Now let's put HLIN and VLIN together. Here is a program to draw a shape.

```
NEW
HOME
10 GR
20 COLOR=5
30 HLIN 20,30 AT 15
40 VLIN 15,25 AT 20
50 HLIN 20,30 AT 25
60 VLIN 15,25 AT 30
RUN
```

With these three commands (PLOT, VLIN, and HLIN) you can draw all kinds of pictures on your Apple.

Getting to the Core

- For graphics, type GR and COLOR= followed by a number from 1 to 15.
- To get out of GRAPHICS mode, type TEXT, then type HOME to clear the screen.
- The PLOT statement lights up squares on the screen.
- The HLIN statement draws lines across the screen.
- The VLIN statement draws lines up and down the screen.
- The numbers for PLOT, HLIN, and VLIN must be between 0 and 39.



Paper and Pencil Exercises

Write the answers in the blanks.

1. To get out of the GRAPHICS mode, type the word

   _____ .

2. You must always begin a graphics program with two GRAPHICS statements. One is GR. The other statement is

   _____ .

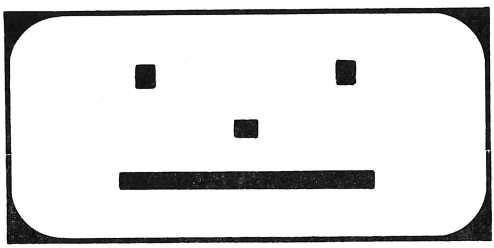
3. To draw a line up and down the screen, use _____ .

4. To draw a line across the screen, use _____ .

5. You must use only the numbers between 0 and _____ when doing graphics.

Computer Exercises

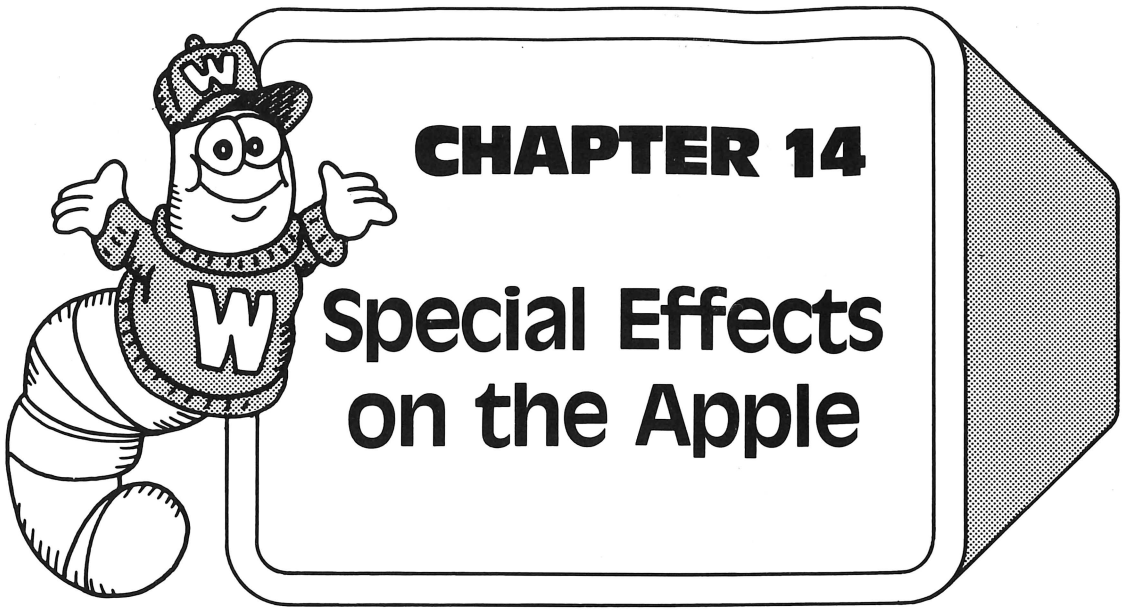
1. Complete the program on the next page so that you will get the RUN that is shown.



```
NEW

10 _____
20 COLOR=8

30 _____ 15,29 AT 9
40 VLIN 9,22 AT 15
50 HLIN 15,29 AT 22

60 _____ 9,22 AT 29

70 _____ 19,14

80 PLOT 26,_____
90 PLOT 22,17

100 _____ 20,26 AT 20
RUN
```

2. This program is supposed to write the word HI. But the program is not correct. There are errors in the lines with the * next to them. Read the program and find the mistakes. Type in the program with your corrections. Then RUN the program and see if you see the word HI on your computer screen. (Hint: All the numbers are correct. Only some of the statements are wrong.)

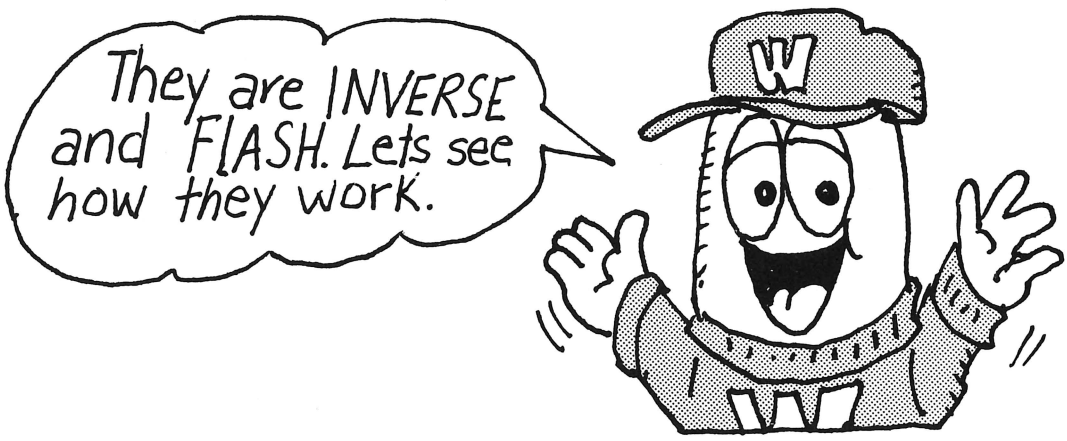
```
  NEW
  HOME
* 10 GRA
* 20 COLOR 6
  30 VLIN 10,22 AT 12
* 40 HLIN 13 TO 18 AT 15
  50 VLIN 10,22 AT 19
* 60 VLIN 10 AND 22 AT 26
* 70 PLOT 26 AND 5
  RUN
```



CHAPTER 14

Special Effects on the Apple

There are some special effects built into your Apple.



Type the following program into your computer.

```
NEW
10 HOME
20 PRINT " ********** "
30 PRINT " WOZZY "
40 PRINT " ********** "
RUN
```

Now we add line 15 to see what INVERSE does.

Type: 15 INVERSE
RUN

Wow! Doesn't that look great?

Let's make one more change. Change line 15.

Type: 15 FLASH
RUN

There you have it—Wozzy in lights!
Now type LIST and you will see the program in lights, too.

To use INVERSE and FLASH, write them before the PRINT statement that you want INVERSED or FLASHED. To get back to normal letters, type NORMAL.

Watch!

Add this line to your program:

Type: 50 NORMAL

Now RUN, then LIST.

The program you typed in is no longer flashing when LISTed. NORMAL tells the computer to return to normal letters.

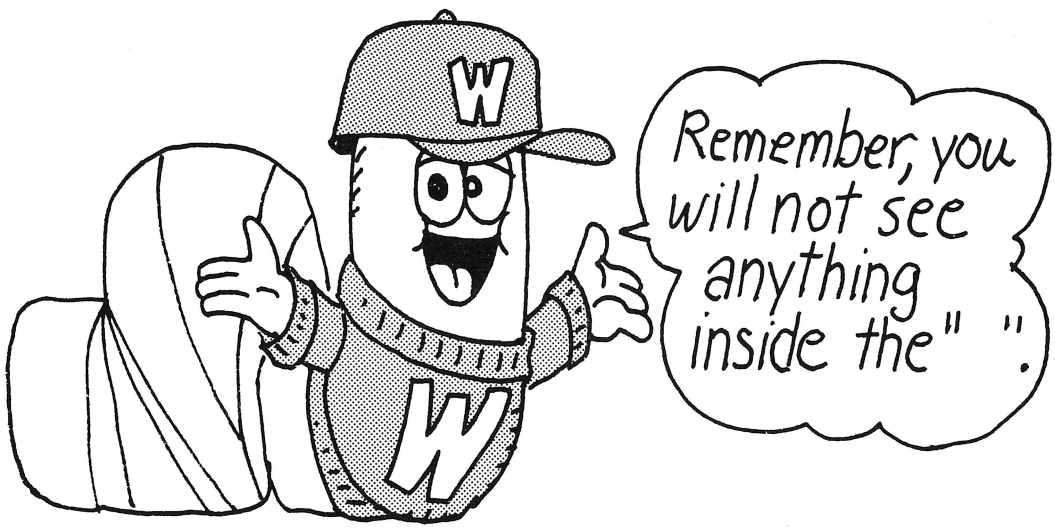
Have fun trying different programs using FLASH and INVERSE. Remember to type NORMAL when you want them to stop.

You can also add "sound effects" to your program. Here's a program that shows how. When you get to line 20, type PRINT and the first ". Then follow the directions that are inside the parentheses. Then type the other ".

```
NEW
10 PRINT "I WILL BEEP 10 TIMES"
20 PRINT " (hold CTRL or CONTROL and press G
   10 times) "
```

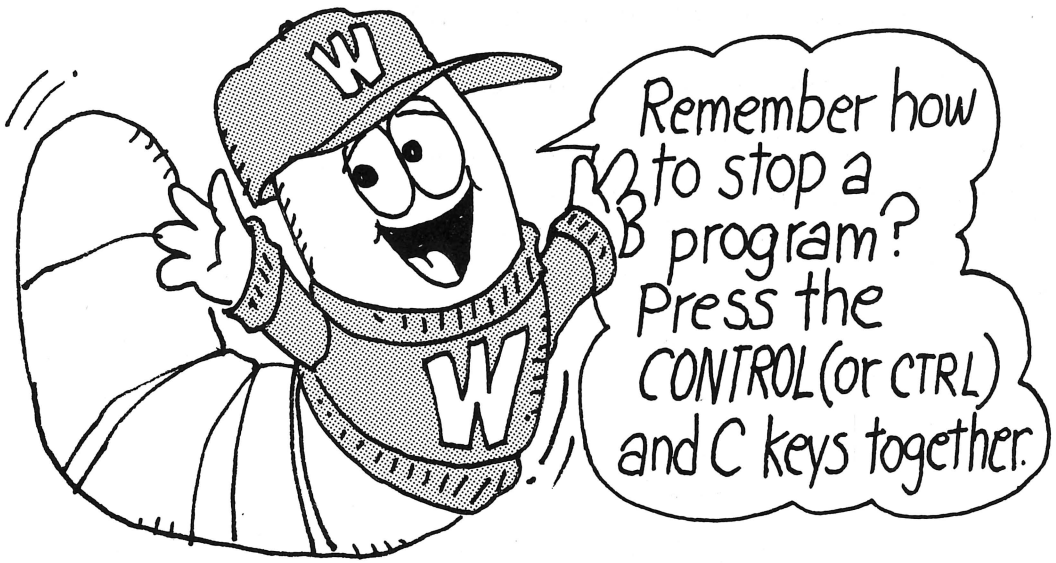
You won't see anything inside the quotation marks. See what happens when you type RUN.

Try changing the number of beeps. To do this, change line 20. Hold CTRL or CONTROL and press G as many times as you wish.



Try this program with FLASH and beeps.

Type:
```
NEW
HOME
10 FLASH
20 PRINT " (hold CTRL or CONTROL and
  press G once) "
30 PRINT "HAPPY NEW YEAR"
40 GOTO 20
RUN
```



The Apple has one more special effect: SPEED.

Your computer's speed is set at 255. You can change the speed by using any number from 0 to 255. Here is a program that shows how to slow down the speed.

Type:
```
NEW
HOME
10 SPEED = 100
```

```
20 PRINT "SEE HOW SLOWLY I WRITE"
30 GOTO 20
RUN
```

Remember to press the CONTROL (or CTRL) and C keys to stop.

To make the speed go back to normal, type:

```
10 SPEED = 255
```

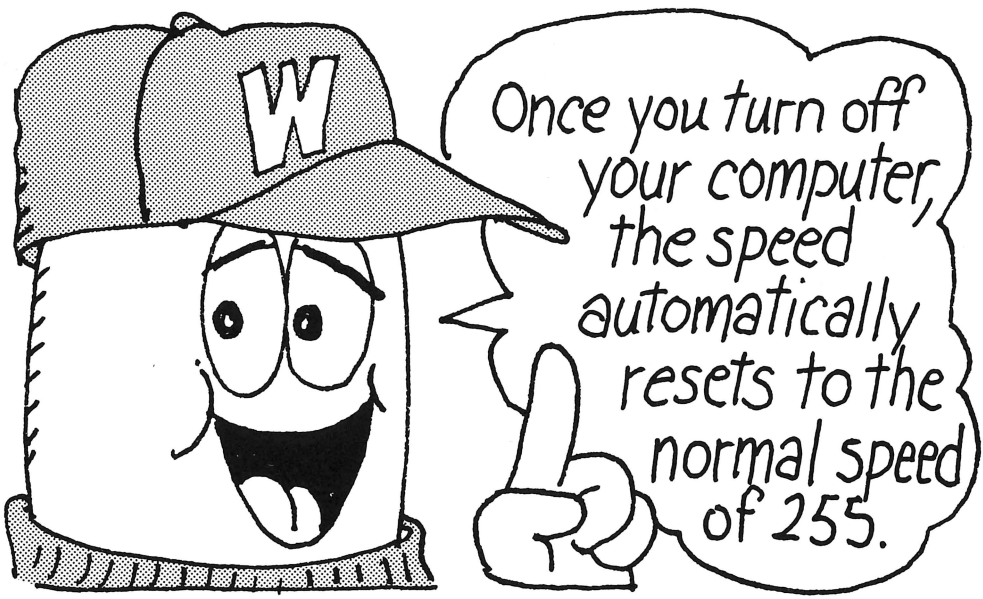
and RUN the program again.

Try different speeds by changing this program.

You can also set the speed before you write a program.

Type SPEED = 150 (or any number from 0 to 255). Now type in your program. This will set the speed for everything that is PRINTed when the program is RUN or LISTed. Just remember, to get back to normal speed, type SPEED = 255.

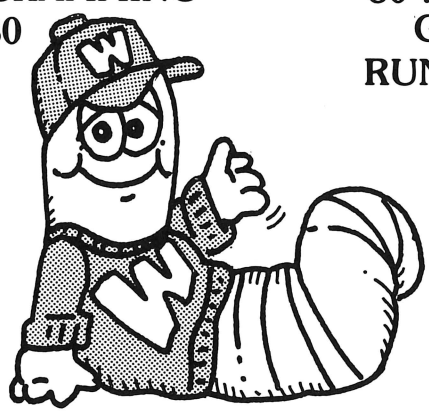
Setting the SPEED affects text programs only; it does not affect the speed at which graphics are displayed.



Programs for Fun and Practice

1.
```
10 ? "+ + + + + + + + + +"
20 ? "YOUR NAME"
30 ? "+ + + + + + + + + +"
40 ?
50 ?
60 GOTO 10
RUN
```

2.
```
10 ? "COMPUTER"
20 GOTO 120
30 ? "CAN BE"
40 GOTO 80
50 ? "BUT IT IS"
60 GOTO 100
70 END
80 ? "HARD"
90 GOTO 50
100 ? "ALSO FUN"
110 GOTO 70
120 ? "PROGRAMMING"
130 GOTO 30
RUN
```



3.
```
10 A = 100
20 ? A
30 A = A - 1
40 GOTO 20
RUN
```

4.
```
10 N = 1
20 ? "7*";N;" = ";7*N
30 N = N + 1
40 GOTO 20
RUN
```

5.
```
10 A$ = "MARY "
20 B$ = "LIT"
30 C$ = "HAD "
40 D$ = "TLE "
50 E$ = "A "
60 F$ = "MB"
70 G$ = "LA"
80 ? A$;C$;E$;B$;D$;
   G$;F$
RUN
```

6.
```
10 ? "I CAN COUNT BY ANY NUMBER."
20 ? "PICK A NUMBER AND I WILL DO IT."
30 INPUT A
40 ? "NOW PRESS THE NUMBER WHERE I SHOULD
 BEGIN COUNTING."
50 INPUT B
60 ? B,
70 B = B + A
80 GOTO 60
RUN
```

7.
```
10 ? "WHAT IS YOUR NAME"
20 INPUT A$
30 ? "HOW OLD ARE YOU ";A$
40 INPUT A
50 ? "WHO IS YOUR BEST FRIEND ";A$
60 INPUT B$
70 ? "HOW OLD IS ";B$
80 INPUT B
90 HOME
100 ? A$;" IS ";A;" YEARS OLD"
110 ? A$;" 'S BEST FRIEND IS ";B$
120 ? B$;" IS ";B;" YEARS OLD"
RUN
```

8.
```
10 ? "TO WHOM AM I SPEAKING"
20 INPUT A$
30 ? "OKAY ";A$;" LET'S DO SOME MATH"
40 ? "PICK TWO NUMBERS TO ADD"
50 INPUT A,B
60 ? "HOW MUCH DO YOU THINK ";A;" + ";B;" IS"
70 INPUT C
80 IF C = A + B THEN ? "YOU ARE RIGHT":END
```

```
90 ? "SORRY, YOU ARE WRONG. TRY AGAIN":GOTO
 60
RUN
```

9.
```
10 ? "WHO IS THE SMARTEST PERSON IN THE
 WORLD"
20 INPUT A$
30 IF A $< >"WOZZY" THEN GOTO 50
40 ? "THAT IS ABSOLUTELY CORRECT!":END
50 ? "WRONG. KEEP TRYING UNTIL YOU GET
 IT":GOTO 10
RUN
```

10.
```
10 FOR X = 1 TO 100
20 ? "*";
30 NEXT X
35 ?
40 ? "DO YOU WANT TO SEE MORE"
50 INPUT A$
60 IF A$ = "YES" THEN GOTO 10
70 ? "THEN I'LL JUST SAY GOODBYE"
RUN
```

11.
```
10 GR
20 COLOR = 8
30 ? "PICK TWO NUMBERS TO PLOT. DO NOT PICK
 ANY NUMBER GREATER THAN 39"
40 INPUT X,Y
50 PLOT X,Y
60 GOTO 30
RUN
```

12.
```
10 GR
20 COLOR = 6
30 ? "PICK THREE NUMBERS, NONE GREATER
 THAN 39"
40 INPUT X,Y,Z
50 HLIN X,Y AT Z
60 GOTO 30
RUN
```

Glossary of Computer Terms

BASIC Beginners' All-purpose Symbolic Instruction Code. The language most microcomputers use.

BIT A part of a byte (a zero or one). There are eight bits to a byte on your computer.

BYTE Eight bits that stand for a single character in the computer. For example, one byte can stand for the letter A or the number one.

CHARACTER A single symbol. Characters can be letters, numbers, or even spaces.

CHIPS The electronic parts that control a computer.

CPU Central processing unit. The main chip that acts like the traffic cop to all information coming into the computer.

CURSOR The blinking square on the screen. It tells where the next character that you type will appear.

DEBUG To correct a program that has mistakes.

HARDWARE The machinery such as the computer, disk drive, cassette recorder, printer, and screen.

MEMORY The part of the computer that holds all the information.

RAM Random access memory. The memory that is used when you type in a program. RAM can be changed when new information is stored. This information will be erased when the computer is turned off.

ROM Read only memory. The memory that includes all the number facts and the BASIC language. This memory does not change and the information will remain in memory after the computer is turned off.

SOFTWARE The programs that are loaded into the computer's memory. Some software comes in the form of a diskette.

Glossary of Statements and Commands

END Tells the computer that the program is finished.
Example: 100 END

FOR/NEXT Creates a loop. It tells the computer to do whatever is between the FOR part and the NEXT part a certain number of times.
Example: 10 FOR X = 1 to 5
20 PRINT "HELLO"
30 NEXT X

GOTO This tells the computer to go to a certain line number in the program.
Example: 10 PRINT "HELLO"
20 GOTO 10

GR Tells the computer to get into GRAPHICS mode.

HLIN Tells the computer to draw a line across the screen.

HOME This clears the screen and moves the cursor to the upper-left corner of the screen.
Example: HOME
10 HOME

IF/THEN Tells the computer to make a choice. When the IF part is true, the computer does what is in the THEN part. When the IF part is not true, the computer goes on to the next line in the program.
Example: 30 IF A$="WOZZY" THEN PRINT "HI WOZZY"

INPUT Tells the computer to wait for information. The information will be either a number value or a string.
Example: 20 INPUT W (a number value)
30 INPUT W$ (a letter or group of characters called a string)

LET Tells the computer to put either a string or a number in a certain mailbox in its memory.
Example: LET B$="CPU"
LET B=15

NEW Tells the computer to erase any program that is in its memory.

PRINT Tells the computer to do math or to copy something on the screen.
Example: PRINT 3*5
PRINT "3*5"

RUN Tells the computer to do the program.

TEXT Tells the computer to go into the TEXT mode. This is usually used to go from the GRAPHICS mode to the TEXT mode.

VLIN Tells the computer to draw a line up and down on the screen.

Glossary of Special Apple Words

FLASH Tells the computer to make whatever follows it flash.

INVERSE Tells the computer to print whatever follows it in inverse color.

NORMAL Tells the computer to print whatever follows in normal letters. NORMAL is usually used to undo FLASH or INVERSE.

PRINT "[CTRL-G]" Tells the computer to beep in the program. You press CTRL or CONTROL and the G inside the quotes.

SPEED Tells the computer how fast to carry out the text in a program. Normal speed is 255.

Appendix A
Helpful Hints for Smooth Programming

1. Always clear the computer's memory before writing a new program. Type NEW.

2. Always press RETURN when ready to go on to the next line in a program.

3. Number each line in a program by 5s or 10s. This will allow you to add additional lines later without retyping the line numbers.

4. Use quotation marks (" ") in a PRINT statement around anything you want the computer to copy.

5. Leave spaces inside quotation marks to keep words from running together.
   Example: 30 PRINT "HELLO ";A$
   (Notice the space after HELLO.)

6. If you get a syntax error, check the line number for spelling mistakes. To correct the mistake, it is easiest to retype the line.

7. LIST a program and debug the program before you RUN it.

8. To skip a line in a program, use a blank PRINT statement.
   Example: 10 PRINT "HELLO"
   20 PRINT
   30 PRINT "GOODBYE"

9. Don't forget to tell the computer to RUN your program and press RETURN.

Appendix B
Saving and Loading Programs: Using the Disk Drive

If you have a disk drive and want to save your programs on the disk, you must "boot," or load, a storage disk into the computer before you begin a program.

To do this, you simply insert your initialized (prepared for the Apple computer) disk in the disk drive and close the door.

Next you must type the word SAVE followed by any name you wish to give to your program (for example: SAVE COUNTING). This will save a program that you have written. This means a COPY of the program will go onto the disk. The program will remain in the computer's memory until you type NEW and press RETURN. The program will remain on the screen until you type HOME and press RETURN.

If you have not prepared or initialized a blank disk so that you can store programs from the Apple computer, follow these directions.

1. You will need the SYSTEM MASTER disk, which came with your computer, and a blank disk or one that you wish to reuse.
2. Insert your SYSTEM MASTER disk in the disk drive and close the door.
3. Turn on your computer. You will hear a whirring noise, which means the disk is loading a program.
4. When the red light on the disk drive goes out, take out the SYSTEM MASTER disk.
5. Be sure the CAPS LOCK key is down. (The Apple II Plus computer will print just capital letters.)

6. Type NEW to erase the program from memory.

7. Insert your blank disk into the drive and close the door.

8. Type INIT HELLO and press RETURN. You will hear a whirring sound and the red light on the disk drive will go on. This means that your disk is being prepared to store programs from the computer's memory.

9. Note: Initializing a disk will erase everything on the disk. You should use only a blank disk or one that you want to erase.

When you are ready to save a program, type SAVE and the name of the program.

```
NEW
HOME
10 LET N=0
20 LET N=N+1
30 PRINT N
40 GOTO 20
SAVE COUNTING
```

To be sure you have saved the program, type NEW, press RETURN, type LIST, and press RETURN again. You will see that there is no program after you type LIST.

Next type LOAD COUNTING. When the red light on the disk drive goes off, type LIST.

Now you have your program back in memory. If you type RUN, you can use the program.

If you don't want a program on the disk anymore, type DELETE followed by the program's name: DELETE COUNTING.

If you have forgotten which programs are on the disk, you can type CATALOG and the computer will give you a list of all the programs on the disk.

Appendix C

Answers to Exercises

CHAPTER 1 ANSWERS

Paper and Pencil Exercises

1. SPACE BAR **2.** ↑ or I **3.** SHIFT
4. RETURN

2 Paper and Pencil Exercises

1. RETURN **2.** HOME **3.** PRINT
4. HI FOLKS **5.** 9,876,543,210

Computer Exercises

1. HI PAL **2.** 9 **3.** 2 * 3 = 6
4. MY NAME IS APPLE **5.** BASEBALL
6. 4 **7.** PRINT "HELLO EVERYBODY"
8. PRINT "3 * 8 = ";3*8

3 Paper and Pencil Exercises

1. B **2.** C **3.** D **4.** A

4 Paper and Pencil Exercises

1. NEW **2.** HOME **3.** RUN **4.** LIST
5. " " **6.** number **7.** number

Computer Exercises

1. TODAY
I AM GOING
TO A PARTY
2. I LIKE
MATH
3. HOME
4. RUN **5.** LIST **6.** 20 PRINT 7
7. 30 [RETURN]
40 [RETURN]
8. 15 PRINT "NOT"
9. RUN **10.** NEW **11.** HOME
LIST

CHAPTER ANSWERS

5

Paper and Pencil Exercises

1. ; **2.** GOTO **3.** zone **4.** 3

Computer Exercises

1. MY NAME IS
ROGER REPEAT
(screen will fill)

2. I LOVE TO GO TO SCHOOL

3. The screen will fill with your name.

4.
```
10 HOME
20 PRINT "I'M GOOD AT MATH"
30 PRINT "5*6",5*6
40 GOTO 20
```

5.
```
20 ?"TWO",
30 ?"THREE"
40 GOTO 10
```

6

Paper and Pencil Exercises

1. 10 5 **2.**
```
10 LET A=3
20 LET B=5
```

3. value **4.** left **5.** 10

Computer Exercises

1.
```
10 LET Y=5
20 LET X=12
30 ? Y;"+";X;"  ";Y+X
```

2.
```
10 MATH
40 ? C;"*";D, C*D
50 GOTO 10
```

7

Paper and Pencil Exercises

1. Any letter **2.** Any group of letters or symbols

3. Any number **4.** Any letter followed by the $

5. Any letter
6. Any letter followed by the $ **7.** Any letter
8. Any group of letters or symbols

Computer Exercise

1.
```
10 "MY COUSIN "
20 12
30 "BOB IS "
```

8 Paper and Pencil Exercises

1. INPUT **2.** ? **3.** number **4.** RETURN
5. GOTO

Computer Exercises

1.
```
HOW MANY DAYS IN A WEEK
?5
YOUR ANSWER WAS 5
THE RIGHT ANSWER IS 7
```
2.
```
HOW MANY FRIENDS DO YOU HAVE
?5
YOU HAVE 5 FRIENDS
```
3. TYPE IN TWO NUMBERS
4. 2
5. Place them in memory locations A and B, print them, and then add them.
6. THE NUMBERS YOU CHOSE WERE 6 AND 7
7. IF YOU ADD 6 AND 7
8. THE ANSWER IS 13
9. Start the program over again.
10. Press CONTROL (or CTRL) and C and press RETURN.
12.
```
40 ? "IF YOU MULTIPLY ";C;" AND ";D
50 ? "THE ANSWER IS ";C*D
```

CHAPTER ANSWERS

9

Paper and Pencil Exercises

1. A$ **2.** B **3.** LIST **4.** HOME
5. NEW

Computer Exercises

1. 20 NAME
30 A$
60 B
70 NOW ADD THEM
80 INPUT

2. 10 ? "WHAT IS YOUR NAME"
20 INPUT N$
30 ? "HOW OLD ARE YOU"
40 INPUT A
50 ? A;" IS A GREAT AGE ";N$

10

Paper and Pencil Exercises

1. < **2.** > **3.** <> **4.** B=6
5. THEN

Computer Exercises

1. 10 PEOPLE IN YOUR FAMILY
30 A THEN
40 A A NICE NUMBER
50 THEN PRINT

2a. FRIENDS DO YOU HAVE
6 FRIENDS ARE A LOT

2b. FRIENDS DO YOU HAVE
4 FRIENDS ARE NOT VERY MANY

11

Paper and Pencil Exercises

1. The program will end. **2.** : **3.** C
4. 40 IF G$="MUSIC" THEN PRINT "MUSIC IS CORRECT.":END

CHAPTER ANSWERS

Computer Exercises

1. 10 THE COLOR OF WOZZY'S BICYCLE.
20 RED.
30 INPUT A$
40 RED RIGHT, WOZZY LOVES RED.
50 A$ THEN
NO. THAT COLOR IS FOR MONKEYS.

2. Line 30 should have A$.
Line 40 should have < > instead of =.

12

Paper and Pencil Exercises

1. FOR/NEXT **2.** C **3.** 5 **4.** :

Computer Exercises

1. WHAT IS YOUR NAME
HELLO WOZZY
HELLO WOZZY
HELLO WOZZY
HELLO WOZZY
HELLO WOZZY

2. 1
2
3
4
5
6
7
8
9
10
THAT'S ALL FOLKS

3. 20 2
30 YOUR NAME
40 A$
60 NEXT X

13 Paper and Pencil Exercises

1. TEXT **2.** COLOR = **3.** VLIN **4.** HLIN
5. 39

Computer Exercises

1. 10 GR
30 HLIN
60 VLIN
70 PLOT
80 14
100 HLIN

2. 10 GR
20 COLOR=6
40 HLIN 13,18 AT 15
60 VLIN 10,22 AT 26
70 PLOT 26,5

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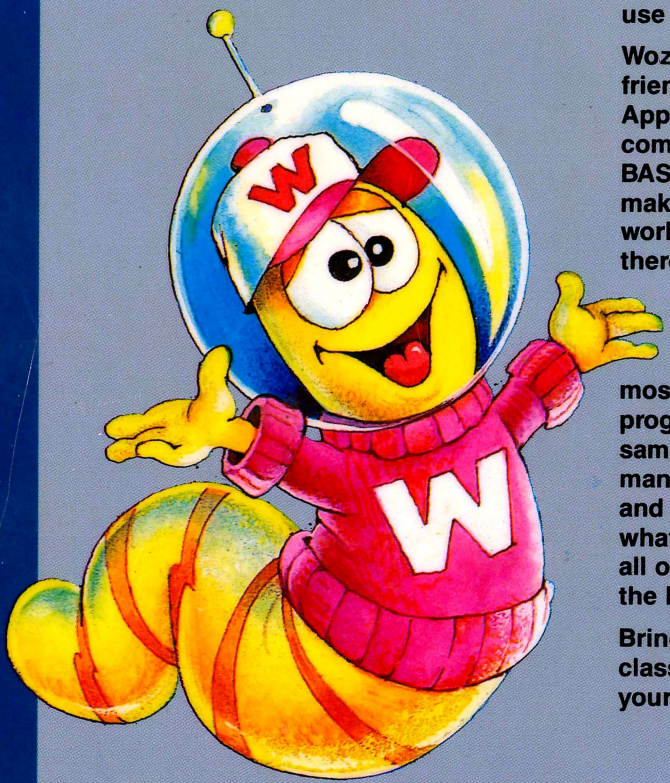
Discovering BASIC with Wozzy



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